Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

UNITED STATES DEPARTMENT OF AGRICULTURE

In cooperation with the
Florida State College of Agriculture

DEPARTMENT BULLETIN No. 1435

Washington, D. C. ▼ November, 1926

LIBRARY
U.S.D.A.
BUREAU OF
HOME ECO

ECONOMIC ASPECTS OF CITRUS-FRUIT GROWING IN POLK COUNTY, FLA.

By

CARL R. SWINSON, Associate Agricultural Economist
and
W. C. FUNK, Associate Agricultural Economist
Bureau of Agricultural Economics

CONTENTS

	Page
Introduction	1
Citrus-Fruit Situation in the United States	2
Section Studied	6
Selection of a Grove Site and Varieties	10
Cost of Developing a Citrus Grove	12
Organization of Citrus-Fruit Farms	15
Grove Operations and Practices	23
Cost of Production of Citrus Fruit	29
Incomes from Citrus-Fruit Farms	33
Summary	39

WASHINGTON
GOVERNMENT PRINTING OFFICE
1926

UNITED STATES DEPARTMENT OF AGRICULTURE

In Cooperation with the Florida State College of Agriculture

DEPARTMENT BULLETIN No. 1435

Washington, D. C. ▼ November, 1926

ECONOMIC ASPECTS OF CITRUS-FRUIT GROWING IN POLK COUNTY, FLA.

By CARL R. SWINSON, *Associate Agricultural Economist*, and W. C. FUNK, *Associate Agricultural Economist, Bureau of Agricultural Economics*[1]

CONTENTS

Page
Introduction 1
The citrus-fruit situation in the United States 2
Section studied 6
  Location 6
  Topography 7
  Drainage 7
  Soils 7
  Rainfall 8
  Winds and storms 8
  Temperature 9
  Roads and other facilities 10
Selection of a grove site and varieties 10
  The land 10
  Facilities for handling and shipping fruit 11
  Kinds and varieties of fruit to grow 11
  Number of trees to the acre 12
Cost of developing a citrus grove 12
  Cost of caring for young groves 13
Organization of citrus-fruit farms 15
  Distribution of the farm acreage 16
  Distribution of crop acreage 17
  Number of trees to the acre 18
  Varieties of citrus fruit 19
  Machinery and equipment 20
  Work stock 20
  Capitalization of fruit farms 21
Grove operations and practices 23
Cost of production of citrus fruit 29
Incomes from citrus-fruit farms 33
Summary 39

INTRODUCTION

Polk County is an area which at the present time represents the most highly developed and intensive citrus-fruit industry in Florida. It possesses a climate, soil, and topography which have been conducive to a remarkable development in a comparatively few years.

It took several hundred years for the orange, after its importation from Spain, to rise to a place of importance in commerce. It was about the year 1884 that shipments of any size began to move out of Florida. Two great obstacles stood in the way of progress in the earlier commercial developments: (1) Lack of transportation facilities and (2) lack of experience in the management of groves in the event of freezes.

---

[1] Acknowledgment is due E. S. Haskell, C. E. Hope, R. J. Leth, Bruce McKinley, H. A. Miller, Frank Montgomery, J. M. Purdom, jr., F. H. Shelledy, C. C. Taylor, of the United States Department of Agriculture, and H. G. Hamilton, of the Florida State College of Agriculture, who assisted in collecting the field data, and to the growers who so generously cooperated in making the study possible.

In the youth of the industry it was necessary to transport the fruit long distances with ox teams over well-nigh impassable roads to ports where the fruit started on a long slow journey in the poorly ventilated holds of ships to consuming centers which seldom were other than sea-coast towns.

Coupled with the problems of transportation were several severe setbacks as the result of freezes, to avoid which there has been considerable shifting of the industry to the south, to areas receiving a degree of protection because of the proximity of large bodies of water, and to areas which, because of physiographical features of the terrain, offer good air drainage. A large measure of protection from freezes has also been obtained in late years through practical development of grove-heating apparatus. Although in the present locations there is still some frost hazard in connection with the production of citrus fruit, its risk has been greatly reduced.

Good wagon roads and a network of railroads with refrigeration facilities throughout the State have given a great impetus to the citrus industry. Some of these tap the now very important Polk County section which heretofore had been left undeveloped.

In conjunction with these improvements two other very important things happened: One of these was the development of a commercial fertilizer which is so necessary in this sandy region, and the other was the immigration of progressive people who were quick to see new and better ways of doing things—people capable of coordinating all the factors essential to a successful business. The natural environment of the greater part of Polk County is unsuited to crops other than citrus fruit and this fact has had much to do with the harmony and rapidity of the development—there have been no cross purposes, the one objective being the improvement of an industry which is the common interest of all.

A study of the organization and cost of operating 100 citrus-fruit farms in Polk County, Fla., forms the basis of this bulletin. The investigation was carried on for six successive years, 1917 to 1922, inclusive. This period included the late war period, when prices were relatively high, and, as a whole, citrus-fruit farming in this area was very profitable. The profitableness of the industry during this period resulted in a decided increase in plantings of trees, and real estate values were on a relatively high level. Since the close of the study the price of fruit has been appreciably less than during the period of the study, and in applying the results to present conditions these changes need to be recognized.

THE CITRUS-FRUIT SITUATION IN THE UNITED STATES

Few agricultural enterprises have gone through the development stage so quickly as has the citrus industry. In a period of 35 years the production has increased from less than 5,000,000 to about 50,000,000 boxes. A large part of this increase was in oranges, although grapefruit and lemons shared in the phenomenal growth of the citrus-fruit industry. (Tables 1 and 2.) California and Florida have always been the leading States. For the season beginning in 1923, they produced all but about 782,000 boxes of the shipped fruit. In that year California produced about two-thirds of all the oranges and practically all the lemons, but Florida produced nearly all of the grapefruit.

Attractive returns from citrus-fruit production have led to a great increase in the plantings of citrus trees in Florida. (Table 3.) Many millions of trees which were planted during the recent period of good fruit prices are yet to come into bearing.

Up to the present time (1925) a market has been found for the product but the trend of prices indicates that in a normal year the supply of fruit, especially that of the lower grades, has been somewhat in excess of a demand that would assure a profit to most growers. In Florida there have been clear indications for some time that certain varieties and grades of oranges and grapefruit have been unprofitable; also that certain locations were not adapted to economical production.

TABLE 1.—*Production of oranges, grapefruit, and lemons, by States, for various periods* [1]

[Thousand boxes—i. e., 000 omitted]

States	1889 [2]	1899 [2]	1909 [2]	1919 [2]	1920 [3]	1921 [3]	1922 [3]	1923 [3]	1924 [3]	1925 [3]
ORANGES										
Florida	3,147	273	4,888	[3] 7,000	8,100	8,700	11,200	14,000	14,100	14,100
California	1,245	5,882	17,440	[3] 16,192	22,030	13,726	21,091	23,095	18,100	20,400
Arizona	--------	11	32	80	60	80	81	86	86	100
Alabama	--------	0	1	41	165	165	350	450	0	150
Louisiana	--------	1	150	37	42	50	60	75	75	100
Mississippi	--------	--------	4	32	25	30	45	55	0	30
Texas	--------	--------	11	9	--------	--------	4	6	12	16
GRAPEFRUIT										
Florida	10	12	1,062	[3] 5,500	5,100	7,000	8,200	9,500	10,500	8,200
California	--------	18	123	[3] 263	304	360	394	363	387	400
Mississippi	--------	--------	1	--------	1	1	1	1	0	1
Arizona	--------	1	1	30	34	35	44	44	44	44
Alabama	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Louisiana	--------	--------	2	--------	--------	--------	--------	--------	--------	--------
Texas	--------	--------	--------	--------	--------	--------	35	65	211	299
LEMONS										
Florida	253	2	12	32	--------	--------	--------	--------	--------	--------
California	306	874	2,756	[3] 3,949	5,255	4,172	3,492	6,840	5,125	6,000

[1] Where leaders occur data were not available.

[2] Data from census reports.

[3] Compiled from records of Division of Crop and Livestock Estimates for season beginning in California Nov. 1, all other States Sept. 1.

TABLE 2.—*Number of orange, grapefruit, and lemon trees of bearing age, by States for various periods*[1]

[Thousand trees—i. e., 000 omitted]

ORANGES

States	1889[2]	1899[2]	1909[2]	1919[2]	1920[3]	1921[3]	1922[3]	1923[3]	1924[3]
Florida	2,725	2,553	2,790	3,684	4,025	4,525	5,125	6,025	7,306
California	1,154	5,649	6,619	[3] 10,800	13,224	16,152	16,456	16,785	17,114
Arizona	--------	49	33	47	50	53	60	68	77
Alabama	--------	--------	3	260	605	660	1,500	1,700	275
Louisiana	6	141	267	104	111	119	128	138	151
Mississippi	--------	4	10	[3] 30	32	34	50	60	25
Texas	--------	1	42	14	--------	--------	--------	145	165

GRAPEFRUIT

States	1889[2]	1899[2]	1909[2]	1919[2]	1920[3]	1921[3]	1922[3]	1923[3]	1924[3]
Florida	3	117	656	1,681	2,044	2,344	2,544	2,644	2,972
California	--------	81	43	231	280	328	385	383	381
Arizona	--------	3	1	19	22	25	26	26	--------
Louisiana	--------	1	3	--------	--------	--------	--------	--------	--------
Mississippi	--------	--------	1	1	1	1	1	2	--------
Texas	--------	--------	5	5	--------	--------	--------	1,262	1,436

LEMONS

States	1889[2]	1899[2]	1909[2]	1919[2]	1920[3]	1921[3]	1922[3]	1923[3]	1924[3]
Florida	85	23	12	--------	--------	--------	--------	--------	--------
California	83	1,493	941	2,885	3,275	3,665	3,748	3,819	3,890
Arizona	--------	2	2	--------	--------	--------	--------	--------	--------
Louisiana	--------	1	1	--------	--------	--------	--------	--------	--------
Texas	--------	--------	1	--------	--------	--------	--------	--------	--------

[1] Trees included were those of bearing age in fall of year shown. Where leaders occur data were not available.

[2] Data from census reports.

[3] Computed from records of the Division of Crop and Livestock Estimates.

TABLE 3.—*Total number of orange and grapefruit trees planted each year in Florida, California, and Texas, 1920–1924*[1]

[Thousand trees—i. e., 000 omitted]

Variety of tree and State	1920	1921	1922	1923	1924	Total planting
Orange:						
Florida[2]	1,643	1,281	1,430	2,471	2,239	9,064
California[3]	--------	64	41	50	105	260
Texas[4]	60	60	40	49	88	297
Grapefruit:						
Florida[2]	461	353	259	504	459	2,036
California[3]	--------	4	58	101	96	259
Texas[4]	225	225	150	184	555	1,339

[1] Data from other States not available.

[2] Compiled from reports of the State Plant Board of Florida. Movement of budded orange and grapefruit stock to Florida points during the past five years. Figures include plantings of tangerines and Satsumas and are for fiscal year ending Apr. 30 of year shown.

[3] Compiled from records of the Division of Crop and Livestock Estimates. No data available for 1920.

[4] Data for Texas adapted from statement on total plantings of citrus fruit trees furnished by E. W. Halstead, agent of the Bureau of Plant Industry. Mr. Halstead's figures show only total plantings of citrus fruit trees in each year. Of the present bearing trees in Texas approximately 20 per cent are oranges and 75 per cent are grapefruit. Figures shown were obtained by assuming that in each year 20 per cent of the total new plantings were orange trees and 75 per cent were grapefruit trees.

Many marginal producers operating inefficiently in favored sections or in locations not adapted to economical production may abandon or neglect their groves. In case of a severe freeze, a few of which have occurred during the past 50 years, production would be reduced. Under normal conditions, however, there will be tremendous increase in production in the near future, and it would seem that the growers will have to call on all their resourcefulness to effect such economies in production and distribution as will enable the profitable handling of the increased quantities of fruit which are in sight for the near future.

Adjustments are being made by Florida growers. The most recent plantings have been either of Valencia, a late-maturing variety, or of trees of carefully selected bud wood taken from earlier varieties of known characteristics. This will result in a better seasonal distribution of the supply and a better and more uniform product. At present, too much of the Florida fruit comes on the market in November and December and much of this early fruit is from seedlings. It lacks uniformity of eating quality and is often of a low grade.

There is now more organized effort in distributing the supply which should help to dispose of it. In 1924 probably more than 60 per cent of the production in the State was marketed through the Florida Citrus Exchange. A large association is in a position to do intelligent and extensive advertising to stimulate domestic demand, to investigate the possibilities of foreign demand, and to develop the use of by-products.

The citrus-fruit grower, besides taking into account the increase of production in his own industry, must also note the competition his product receives from other fruits. In Table 4 are shown the yearly car-lot shipments of those fruits that offer competition. For the five years given there has been an increase of 116,941 car lots in car-lot shipments of fruits and melons, other than citrus, or from 223,511 for the 1919 season to 340,452 for the 1923 season. The greatest absolute increase in shipments was for apples and grapes, the increase for these two commodities being 51,339 carloads of apples and 34,981 carloads of grapes. Other fruits, notably strawberries, pears, and plums, have shown large relative increases. The effect of the increase in the supply of other fruits and melons on the price of citrus fruit can not be determined definitely; but it is obvious that, if the production of other fruits and melons continues to increase, it will accentuate the need for efficient production and marketing of citrus fruit.

TABLE 4.—*Car-lot shipments of fruit, 1919–1923*

Commodity	Crop movement season beginning Sept. 1—				
	1919	1920	1921	1922	1923
Apples	86, 764	115, 878	89, 683	113, 849	138, 103
Cantaloupes	22, 039	22, 953	25, 815	29, 930	24, 771
Cherries	1, 025	1, 730	1, 489	2, 261	2, 501
Grapes	30, 349	41, 310	37, 816	59, 914	65, 330
Peaches	30, 923	28, 179	27, 334	38, 405	33, 525
Pears	10, 244	15, 941	13, 053	20, 381	18, 589
Prunes and plums	3, 202	5, 001	5, 765	5, 211	6, 800
Strawberries	8, 105	7, 207	10, 857	18, 761	17, 804
Watermelons	30, 860	37, 315	45, 749	47, 625	33, 029
Total	223, 511	275, 514	257, 561	336, 337	340, 452
Citrus fruits	68, 889	91, 113	67, 406	97, 834	108, 650
Total	292, 400	366, 627	324, 967	434, 171	449, 102

SECTION STUDIED

LOCATION

Polk County is situated almost exactly in the center of the Florida Peninsula (fig. 1). It is the second largest county in the State and has an area of 1,907 square miles. It produces more citrus fruit than any other county. Other large centralized fruit areas may be found (1) north of Polk County in Lake and Orange Counties, (2) on the west coast in Pinellas and Manatee Counties, and (3) on the east coast along the Indian River in Volusia, Brevard, and St. Lucie Counties. Many smaller citrus regions are found in various localities throughout the central and southern part of the State.

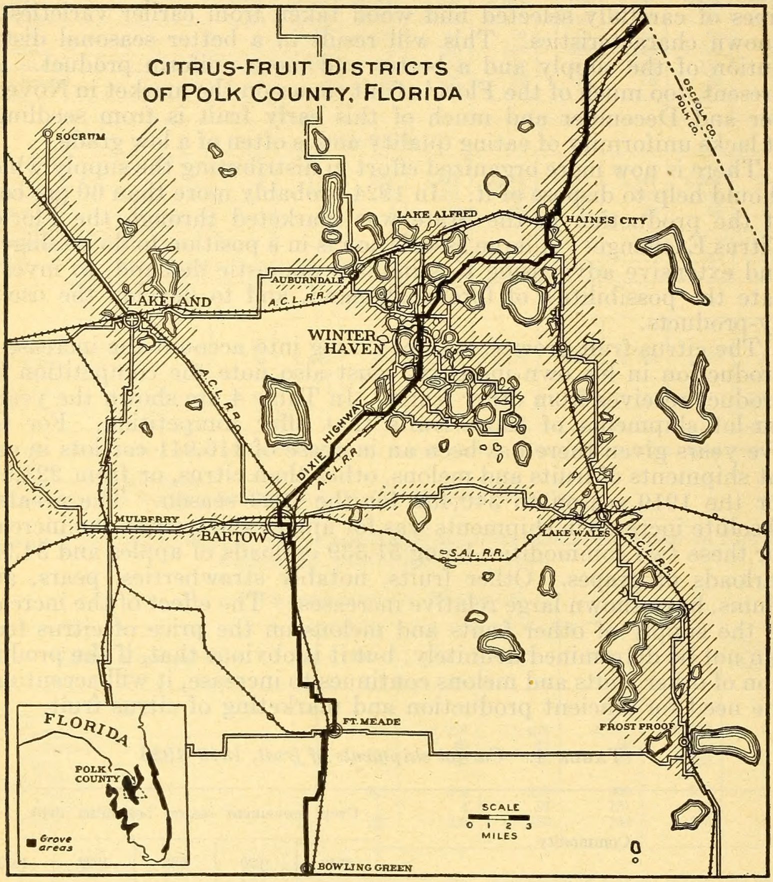

FIG. 1.—The farms studied were in Polk County, in the central part of Florida. The county is dotted with numerous lakes and has regions of good elevation. Its excellent transportation facilities are in the form of railroads and hard-surfaced highways

TOPOGRAPHY

Polk County is flat to rolling. It has the highest point in the State at Iron Mountain, near Lake Wales. This mountain, so called, rises 326 feet above sea level and is a part of the ridge section known as the "Scenic Highlands." The ridge extends through the entire eastern part of the county and in recent years has been intensively developed for citrus growing. Rolling country and many beautiful lakes are characteristic of the Scenic Highlands. (Fig. 2.)

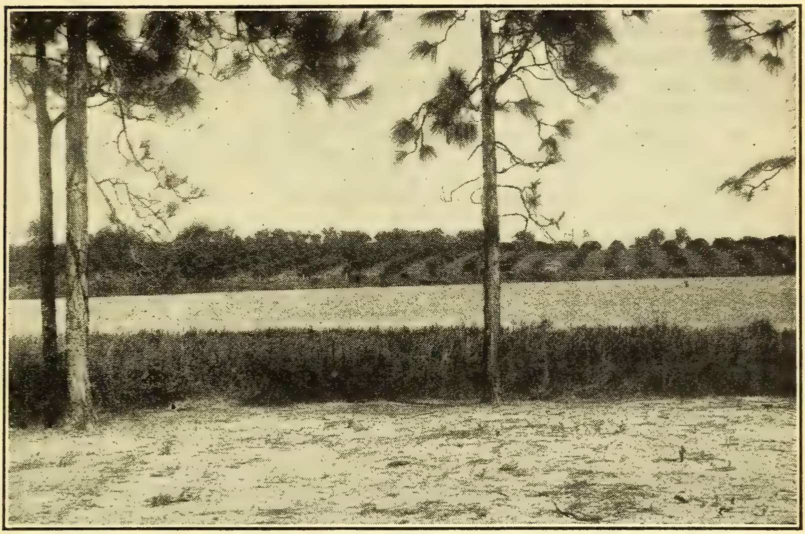

FIG. 2.—Grove development has centered around the lake region of the county where higher lands adjoin. The lakes afford considerable protection to the groves in extreme changes of temperature

DRAINAGE

Peace River and its tributaries through the central part of the county drain it to the south. This drainage basin forms the center of a territory, question mark in shape, the rim of which corresponds roughly to the citrus district in Polk County, except that it does not include the strip of citrus land extending north and south through and approximately 8 miles on either side of the city of Lakeland. The Lakeland section is divided from the rest of the citrus district in the State by another drainage basin formed by Lakes Hancock and Adriana and the various creeks pouring into them. (Fig. 1.)

SOILS

Most of the groves in Polk County were planted on rolling upland pine lands. Technically, this soil is known as Norfolk sand and is generally considered best for citrus growing as air and water drainage is usually good and sandy soil underlain with clay subsoil responds well to treatment. Good groves occur on the high and low hammock lands where proper drainage has been secured.

Most of the high pine lands are deficient in all plant-food elements and humus. No attempt is made to grow a fruit crop without the use of commercial fertilizer. The humus is usually supplied by the use of a volunteer cover crop. Each fall most of the growers plow or disk under crops of beggarweed and grass which reseed themselves each year; or, occasionally a legume crop, such as cowpeas. The loose character of the soil makes cultivation an easy matter.

RAINFALL

Rainfall at Bartow, Polk County, over a period of 30 years, averaged 52 inches a year. The period of greatest rainfall begins in June and terminates in September. The dry season begins in October and with very little variation continues until May. (Table 5.)

TABLE 5.—*Average monthly rainfall for 26 years (1887–1912) at Bartow, Polk County, Fla.*[1]

Month	Rainfall	Month	Rainfall
	Inches		*Inches*
January	2.36	August	7.67
February	2.64	September	8.19
March	2.34	October	3.55
April	1.74	November	1.81
May	3.83	December	2.32
June	8.33		
July	7.53	Total	52.31

[1] Reprint, sec. 84, Southern Florida, p. 4. U S. Dept. of Agr. Weather Bur.

Rainfall plays an important part in the production of citrus fruit. Practically all fertilization and cultivation of citrus fruit is done during the dry season from October to June. It is during the rainy months from June to September, inclusive, that cover crops of weeds, grasses, or legumes are grown, to be worked up later to improve the humus content of the soil. Generally there is so much rainfall during the summer months that heavy cover crops may be grown without danger to the trees from drought.

Rainfall is usually sufficient when properly distributed, but drought conditions occur on an average of one year in four. A severe drought occurred in 1922 when a great deal of fruit was lost. During this drought period several growers reported that they stopped their fruit from dropping by constant stirring of the soil with the harrow. The tractor proved particularly efficient during the drought because of the acreage it could cover quickly and thoroughly, even on the hottest days. An abundance of water is available in the many lakes everywhere in this region. At present, however, few growers have installed irrigation systems, and those only in a limited way.

WINDS AND STORMS

This is what the United States Weather Bureau says about winds and storms for the west coast of Florida:

> Winds are northeasterly most of the time. Severe storms of the West Indian type are liable to occur occasionally; in fact, moderately high winds may be expected every year, as disturbances move northward from the Tropics, mainly from August to October. Thereafter, however, the weather is ideal, and storms of any consequence are the exception.

The average annual wind movement for the west coast is 6.7 miles per hour, the average monthly movement being above 5.5 and not higher than 7.5 miles per hour.

TEMPERATURE

The temperature for this region is noted for its uniformity. Though the summers are long, the extreme of heat is rarely 100° F. During the warmest part of the day atmospheric circulation is most active, the winds sweeping across the peninsula from ocean or gulf, mitigating in a great measure the disagreeable consequences of warm days and high humidity. The warmest weather occurs during July and August, when maximum temperatures of 100° F. or slightly above may be recorded. The mean annual temperature is 72°; mean summer temperatures, June to September, range from about 80 to 82°; and mean winter temperatures, December to February, range from 59 to 62°. January is the month of lowest average temperature with a mean of 59.9° F. over a period of 20 years, but the most severe cold waves have occurred in February.

Seasons of widespread disaster to fruits and vegetables were January, 1886; December, 1894; and February, 1895 and 1899, which comprehend the extreme conditions that have occurred during the fundamental period 1871 to 1912. Authentic data covering a period of about 50 years antedating 1871, show that severe cold waves occurred in Florida in 1835 and 1857. Other authentic data give 15 severe freezes in a period of 175 years, or an average of one freeze every 11.6 years. During this entire period, however, only three freezes, those occurring in 1835, 1886, and in the winter of 1894–95 are classed as "great freezes" which killed back young trees and severely damaged bearing trees.

The average date for the first killing frost at Bartow, Polk County, is December 19, and the average date of the last killing frost is February 11. The date of the earliest killing frost on record is November 14, and the date of the latest killing frost on record is April 17. Bartow is somewhat lower in elevation as compared with most of the district planted to citrus trees. It is possible that, because of this lower elevation, Bartow may have experienced low extremes in temperatures more often than would be the case on the higher citrus land with better air drainage.

Not many of the growers coming within the scope of this study had made any serious preparations to heat their groves in the event of frost. Many groves receive a measure of protection from frosts because of location near lakes where the temperature is moderated to some extent, and many groves are located on rolling ground which provides good air drainage. But most of the severe freezes which have occurred in Polk County have been accompanied by high winds so that lakes and windbreaks failed to give absolute protection. (Table 6.)

TABLE 6.—*Number of days with minimum temperatures 32, 25, 20,*[1] *and 18° F. or below from 1891 to 1924, Bartow, Polk County, Fla.*

Year beginning July 1—	32° F.	25° F.	20° F.	18° F. or below	Year beginning July 1—	32° F.	25° F.	20° F.	18° F. or below
1891	2	0	0	0	1908	4	1	0	0
1892	11	1	0	0	1909	11	3	0	0
1893	2	0	0	0	1910	10	0	0	0
1894	6	4	1	0	1911	9	0	0	0
1895	3	0	0	0	1912	1	0	0	0
1896	6	0	0	0	1913	3	0	0	0
1897	6	2	1	1	1914	5	0	0	0
1898	4	1	0	0	1915	13	0	0	0
1899	6	0	0	0	1916	7	2	0	0
1900	8	0	0	0	1917	10	1	0	0
1901	8	1	0	0	1918	3	0	0	0
1902	3	0	0	0	1919	6	0	0	0
1903	6	0	0	0	1920	0	0	0	0
1904	6	3	1	0	1921	0	0	0	0
1905	0	0	0	0	1922	0	0	0	0
1906	6	3	1	0	1923	0	0	0	0
1907	5	0	0	0	1924	0	0	0	0

[1] U. S. Dept. of Agri., Weather Bur.

ROADS AND OTHER FACILITIES

Perhaps few other activities have aided development in Polk County so much as the network of fine roads. In 1924 Polk County had approximately 346 miles of asphalt-surfaced roads. The value of hard-surfaced roads to this community may be better appreciated after an understanding of the soil characteristics, for with sand having a depth of 4 feet or more, teams or trucks would haul heavy loads on unsurfaced roads only with great difficulty.

Polk County has many rapidly growing little cities with every modern improvement. The location of these cities on the shores of lakes makes them attractive places to live. With 600 lakes in the county, it is possible for a great many people to find desirable home sites. The schools, churches, and clubs are a source of great pride to the citizens.

SELECTION OF A GROVE SITE AND VARIETIES

No attempt should be made to buy or plant a grove without a previous thorough study of the problems involved. Lacking this, the best substitute is probably the service of some one with experience in the district and the industry. All such matters as soil, topography, home site, roads, packing-house facilities, shipping facilities, by-product manufacturing plants, necessary capital, varieties of citrus fruit, bud wood, and root stock are important and the lack or failure of any one of these may have much to do with the success of the business venture.

THE LAND

In selecting a grove site in Polk County, the following points with respect to the land should be kept in mind:

1. It should have good water and air drainage.
2. The soil should have a good depth of Norfolk sandy loam or other desirable soil, which is underlain with clay and not hardpan. Two to four feet of sand is about the right depth.

3. The title to the land should be carefully investigated, especially to that land which has never been under cultivation.

If the land for the grove is being selected with a view of making a home on it, it would be well for the prospective grower to know something about the neighborhood characteristics. Some districts, because of high elevation and good drainage along with other desirable features, will develop much more rapidly and progressively than others. The standard of living already acquired, makes it almost imperative with some people that their surroundings be congenial and in part at least susceptible to changes which will provide customary comfort and privileges.

FACILITIES FOR HANDLING AND SHIPPING FRUIT

Though good judgment should be exercised with respect to land values, such values in the end are relative; that is, cheapness is not necessarily always the first matter of importance in choosing between sites even though the quality of the soil be exactly the same. One piece of land may be higher in value than another of similar quality because of a more desirable location with respect to good roads, packing houses, by-product plants, icing plants, better shipping, and other facilities. Large numbers of growers closely associated can often afford services which would be entirely too costly to growers in widely scattered places. As a consequence of its proximity to facilities, land may be comparatively high; yet, in comparison with cheaper sites, its economic advantages may prove such that the greater price will be offset.

KINDS AND VARIETIES OF FRUIT TO GROW

Economies can be effected and net receipts materially increased if proper caution is exercised at planting time with respect to the selection of varieties, rootstock, and the number of trees to the acre.

Altogether a great many varieties of oranges and several varieties of grapefruit and tangerines are grown in the Polk County groves. This fact has much significance in the development of the industry. New types and varieties are continually appearing and many growers are encouraged to plant trees of new varieties which have not been thoroughly tested. Eventually the growers will learn from experience what varieties are in greatest market demand and bring the best prices. Many progressive growers already recognize that there is an advantage in growing only a small number of good varieties, properly selected as to quality, trueness of type, and time of maturity of the fruit.

At present there are three outstanding varieties of oranges: The Parson Brown, the early variety; the Pineapple, the main winter variety; and the Valencia, the latest variety of the three. Many new plantings are of the Valencia because the late varieties usually bring a better price though there is some small risk in carrying oranges on the trees through the winter. It is generally agreed that it is good policy to plant some of each of the seasonal varieties, that is, varieties which ripen in the fall, winter, and spring.

There is less difference in the characteristics of grapefruit varieties than in the characteristics that distinguish the different varieties of oranges. Some of the most common varieties other than the grapefruit known as Florida Common are the Hall (more often known as Silver Cluster), Marsh, Walters, and Duncan. The principal tangerine is the Dancy, although a few King are found, and recently the Temple, a new variety, is receiving some attention by growers.

The part of the total acreage to be planted to each kind of fruit must remain largely a matter of personal preference. This study indicates, as discussed more fully later, that the kinds of fruit that led in net profit per acre were tangerines, oranges, and grapefruit, in the order named, but this relation may not necessarily always hold good. For example, a marked increase in the acreage of tangerines might result in a production in excess of the demand at present prices.

A very important matter to consider before buying trees is that of rootstock. In most of the Polk County district the soil is high pine and is more favorable to the growth of trees if they have been budded to rough lemon stock. Many groves that were set 10 or 12 years ago on the high pine land have, here and there, a tree of dwarfed and peculiar characteristics, because the grower was unfortunate in getting a few trees that were budded on the sour orange or other rootstock not suited to this high pine land. Many growers have removed the undesirable trees and have replanted with trees having the rough lemon root. Such replanting gives the grove an uneven appearance and is a direct loss to the grower not only in the expense of grubbing out the old trees and replanting new ones, but in the loss of producing power of the grove. When necessary to replace trees, some growers consider it a more desirable practice, where possible, to purchase and reset trees similar in age to those in the grove. In a short time, the grove assumes a normal appearance and is in condition to produce regular crops.

NUMBER OF TREES TO THE ACRE

The number of trees that should be planted to an acre of ground has been and will continue to be a much-debated question. The analysis of this phase of the development, as brought out in the discussion elsewhere in this bulletin, would seem to indicate that there is justification in planting trees rather close in comparison with what is regarded as normal practice. In Table 7, showing the cost of development per acre, 64 trees per acre were considered because that figure represents the average for the groves under consideration in this study. It is believed, however, that 80 or more trees should be planted with the object in view of getting the income from the additional trees until such time as crowding makes it necessary to remove some of them. There would be some additional development expense per acre in any provision for additional trees, in the cost of the extra trees, planting, and, later on, the quantity of fertilizer above that shown for normal requirements on 64 trees per acre.

COST OF DEVELOPING A CITRUS GROVE

The cost figures here used apply only to Polk County. Conditions vary a great deal throughout Florida and to a considerable extent throughout Polk County with respect to development costs.

The figures cover conditions as they were found during the later years of the survey, that is, from 1919 to 1922, inclusive. They represent a fairly large number of observations, but even so they might be subject to many changes in the different items of cost.

TABLE 7.—*Cost of grove development up to and including the fifth year.* (*Average 1919–1921*)

	Cost per acre	
Land	$125	
Clearing land	25	
Clearing of roots and plowing	10	
Fencing	15	
Trees—64 at $0.75 each	48	
Setting trees	5	
Initial cost	228	
Interest at 8 per cent for 5 years	91	
		$319
Maintenance of grove, 5 years [1]	182	
Interest on maintenance charges	35	
Total maintenance cost, 5 years		217
Total cost per acre		536

Good citrus land may be purchased for $150 an acre, and, on the other hand, there is land which is desirable at $400 per acre. The former figure quoted is regarded as a representative one for the location and the time under consideration. Changes are taking place rapidly and these figures can not possibly be reliable for any length of time.

The costs of clearing, plowing, fencing, and setting trees vary considerably from grove to grove. Large development companies doing things on a wholesale scale can make many economies through the use of tractors and large machinery and through the more efficient use of labor crews. The costs presented here are more representative for groves of about 10 acres. Even with small groves it is usual to have the clearing done by contract work. Many nurseries will give advice and other aid in the setting of the trees as a part of their sales service.

A great many growers have gone into Polk County with scarcely any capital and a number of them unquestionably have been successful. There is little doubt, however, that they worked very hard under pioneering conditions which demanded much self-sacrifice in the way of comforts and community privileges. The amount of money needed to develop a grove to bearing age has changed materially since the pioneer days. The purchase price of the land, taxes, materials, and labor are all higher as a result of many community improvements. It will be seen from Table 7 that a grower must now have approximately $500 per acre invested before any return can be expected. Besides the expense of development, he has his living costs to provide.

COST OF CARING FOR YOUNG GROVES

The figures presented in the Tables 8, 9, and 10 were obtained from grove owners in Polk County. The groves are from 1 to 5 years old and include both oranges and grapefruit. There are 39 groves 1 year old, twenty-eight 2 years old, twenty-eight 3 years old, twenty-six 4 years old, and twenty-seven 5 years old a total of 148 groves for the three years 1919, 1920, and 1921. The figures in Tables 8 and 9 are averages for the three years in each age group.

---

[1] Maintenance cost includes $15 for upkeep of fences and unclassified items of expense.

The important items of cost in the care of a young grove are labor and fertilizer. Spray material is a relatively small item for young trees.

In computing these costs no charge is made for the use of land, buildings, and machinery. Man labor is charged at 30 cents and horse labor at 20 cents an hour.

It will be seen from Table 9, that the cost of labor and the cost of materials increase with the age of the trees. The total labor cost ranged from an average of about $16 per acre for the 1-year-old trees to $22 per acre for the 5-year-old trees. The fertilizer applications ranged from 247 pounds per acre to 921 pounds per acre.

Table 8 shows the average number of hours of man and horse labor per acre in each of the age groups for trees from 1 to 5 years old. Plowing and harrowing are the more important tillage operations from the standpoint of amount of labor required. The tree rows are cultivated throughout the year (fig. 3). Comparatively few groves were disked and less than one-third of the total were mowed as will be seen from Table 10. Table 8 further shows that there was comparatively little variation in the number of hours of labor used for tillage operations as the age of the trees increased. The hours of labor for hoeing and pruning gradually increased as the trees got older. This is also true for labor in spraying and fertilizing.

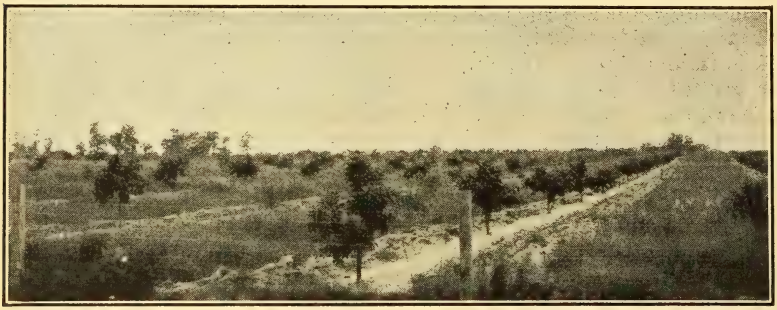

FIG. 3.—It is the usual practice with young groves to keep the strip of ground on which the trees are set cultivated clean throughout the year. The wide strips between the tree rows are plowed once a year. The weeds turned under add much needed humus to the soil

The total hours of man labor per acre for all the operations average 31.5 hours for the 1-year-old trees to 46.4 hours for the 5-year-old trees. Hours of horse labor for the same groups range from 32.7 to 40.2.

There is considerable variation in the number of times an operation is performed. For example, some groves are sprayed once, others are sprayed two or more times. Table 10 shows the number of groves on which certain operations were performed and the number of times the operation was done. The column headed "Plowing" shows that 6 of the 148 farms were not plowed, 47 were plowed once, 12 three times, and 7 were plowed more than three times. Disking has not become general in citrus groves. Only 22 of the 148 groves were disked. The operation of harrowing is rather generally performed. Only 8 of the 148 groves were not harrowed. Less than one-third of the groves were banked during the three years. Hoeing is rather general—only 5 of the 148 groves were not hoed. Spraying was omitted on 65 of the 148 groves. All of the groves were fertilized one or more times.

TABLE 8.—*Amount of labor per acre in the care of 148 young citrus groves in Polk County, Fla. Average 1919, 1920, and 1921*

Age of trees	Area planted	Time required per acre for—								
		Plowing, disking, harrowing, mowing		Banking, hoeing, pruning	Spraying		Fertilizing		Total	
		Man	Horse	Man	Man	Horse	Man	Horse	Man	Horse
	Acres	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*	*Hours*
1 year	369	17. 5	30. 2	9. 2	1. 4	0. 8	3. 4	1. 7	31. 5	32. 7
2 years	254	21. 1	31. 7	9. 1	1. 5	1. 2	3. 4	1. 7	35. 1	34. 6
3 years	243	24. 0	32. 0	12. 0	2. 0	1. 7	3. 5	1. 8	41. 5	35. 5
4 years	146	23. 9	33. 0	13. 2	4. 3	3. 9	3. 6	1. 8	45. 0	38. 7
5 years	247	22. 1	33. 5	14. 7	5. 7	4. 8	3. 9	1. 9	46. 4	40. 2

TABLE 9.—*Cost per acre of labor and materials for the care of 148 young citrus groves, Polk County, Fla., average 1919–1921*

Age of trees	Area planted	Time employed		Labor cost			Fertilizer used		Cost of spraying material	Total per acre cost
		Man	Horse	Man	Horse	Total	Quantity	Cost		
	Acres	*Hours*	*Hours*	*Dollars*	*Dollars*	*Dollars*	*Pounds*	*Dollars*	*Dollars*	*Dollars*
1 year	369	31. 5	32. 7	9. 45	6. 54	15. 99	247	6. 80	0. 18	22. 97
2 years	254	35. 1	34. 6	10. 56	6. 90	17. 46	273	7. 50	. 24	25. 20
3 years	243	41. 5	35. 5	12. 48	7. 08	19. 56	450	12. 37	. 33	32. 26
4 years	146	45. 0	38. 7	13. 50	7. 72	21. 22	618	17. 00	. 39	38. 61
5 years	247	46. 4	40. 2	13. 89	8. 04	21. 93	921	25. 32	. 45	47. 70

TABLE 10.—*Frequency of operations in the care of 148 young citrus groves, Polk County, Fla., average 1919–1921*

Number of times each operation was performed	Groves reporting								
	Plowing	Disking	Harrowing[1]	Banking	Hoeing	Spraying	Mowing	Pruning	Fertilizer
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
0	6	126	8	103	5	65	104	101	0
1	47	10	(1)	45	31	24	41	42	13
2	76	4	(2)	0	55	23	1	5	49
3	12	1	(3)	0	30	19	2	0	64
4 or more	7	7	(4)	0	27	17	0	0	22

[1] 38 groves were harrowed 1 to 4 times.
[2] 69 groves were harrowed 5 to 10 times.
[3] 21 groves were harrowed 11 to 15 times.
[4] 12 groves were harrowed 16 to 20 times.

ORGANIZATION OF CITRUS-FRUIT FARMS

Citrus-fruit growing in this district is a highly specialized industry. The receipts from citrus fruit on the average made up 96 per cent of the total farm receipts during the period of the survey. A majority of these grove farms have no other receipts than those from citrus fruit. Consequently, the end in view in developing the farm organization is the more efficient production of citrus fruit. Nearly all the growers practice diversity in citrus-fruit production; that is, each grower usually has several varieties of oranges and grapefruit to extend the marketing season and thus lend stability to the industry. There is an element of safety in the growing of several different citrus fruits, such as oranges, tangerines, and grapefruit, in that it is not likely that there will be a poor marketing season for all of these fruits the same year.

Many of these grove farms studied had no cultivated land other than that planted to citrus trees, but it was the usual thing to have a few acres of woods and waste land, the waste land usually being low and wet. In some instances, grove owners pastured their wooded acres; but since the livestock enterprise for most farms was a negligible factor, and the pasturing of woods in the citrus district required good fences, not much pasturing was done within the most highly developed sections.

The groves managed by caretakers averaged much less in crop acreage than the owner-operator groves, the average farm being 15.4 and 43.2 acres, respectively. On the owner-operator farms, some feed crops were raised and sales of general crops and livestock were reported, but in nearly all instances the quantity of feed crops raised was small. There seems to be no basis of comparison here as to the influence of general crops or livestock enterprises on the effectiveness of the farm organization. In most instances no enterprise of any extent, other than that of fruit, existed.

The most important factors in organization, as reflected in net returns, are the number of prolific trees per acre, the selection of the proper varieties of fruit, utilization of the surface of the ground as completely as possible, and the necessary materials, equipment, labor, and experience properly to care for the trees.

Many of the groves were owned by growers who did not live on the farm and caretakers were employed. In some cases the owner lived near enough to the grove to give it some supervision. When the grove was managed by the owner-operator, the organization was usually a complete unit; but when operated by a caretaker, he usually furnished all equipment and laborers were paid on the basis of the amount of work performed. About one-half of the caretaker groves had no buildings. Caretakers who had supervision of several groves maintained a central establishment where teams and all necessary equipment were kept. In most instances highly satisfactory results were obtained from caretaker groves, and in general the production of groves and the returns per dollar of investment were about the same for the farms operated by caretakers and those operated by owners.

The caretakers, on the whole, are responsible men of high standing in their communities. They possess considerable experience and ability, and some own grove property themselves.

DISTRIBUTION OF FARM ACREAGE

The 100 grove farms studied averaged 41 acres. The total acreage per farm did not show any appreciable change over the six-year period of the investigation. Of the 41 acres, 9.7 was woodland, 3.7 was waste land, and 27.6 was tillable land. (See Table 11.) The tillable acreage per farm increased approximately 2 acres over the six-year period, because of acquisition of new land and the clearing of woodland.

The majority of the farms had small acreages in woodland and a small area of waste land, but there were a few with large acreages of woods. Any expansion in fruit acreage for the majority of growers must come through purchase rather than through reclamation of land.

TABLE 11.—*Distribution of land per farm on 100 farms in Polk County, Fla., 1917–1922*

Distribution of farm land	Distribution of land per farm						Average
	1917	1918	1919	1920	1921	1922	
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Woodland	10.9	10.4	9.8	9.6	8.8	8.5	9.7
Waste	3.8	3.8	3.7	3.7	3.6	3.6	3.7
Tillable	25.8	27.0	28.1	27.8	28.5	28.4	27.6
Total farm area	40.5	41.2	41.6	41.1	40.9	40.5	41.0
Owned	40.5	40.9	41.5	40.8	40.8	40.4	40.8
Cash rented		.3	.1	.1			.1
Share rented				.2	.1	.1	.1

DISTRIBUTION OF CROP ACREAGE

The six-year average crop acreage per farm for the 100 farms was 26 acres. The crop acreage was divided as follows: Bearing fruit 18.4; nonbearing fruit, 5.9; corn, 1; hay, 0.2 of an acre; and other crops, 0.5 of an acre. (See Table 12.) Twenty-seven of the 100 farms had some land in corn of which 17 farms had more than 1 acre, six farms had more than 5 acres, and two had more than 10 acres. Twenty-six growers had small patches of corn in their groves, but only in four instances did the amount equal 5 acres. Two-thirds of the growers having outside land in corn, also had corn interplanted in young groves. Hay was almost exclusively made up of beggarweed cut in the grove. Five growers cut hay from land not in grove, but the acreage in those instances only twice exceeded 1 acre in area.

TABLE 12.—*Distribution of crop area on 100 farms, Polk County, Fla., 1917–1922*

Fruit tree or crop	Distribution of crop acreage per farm						Average
	1917	1918	1919	1920	1921	1922	
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Acres in bearing fruit	14.4	15.9	18.2	19.6	20.6	21.0	18.4
Grapefruit	5.5	6.4	7.6	8.6	8.6	8.8	7.6
Oranges	7.9	8.4	9.5	9.9	11.1	11.3	9.7
Tangerines	.8	.9	.9	.9	.9	.9	.9
Other fruit	.2	.2	.2	.2			.2
Nonbearing	7.4	6.3	6.2	5.5	5.3	5.2	5.9
Grapefruit	3.5	2.5	2.0	.4	.3	.3	1.5
Oranges	3.8	3.6	3.9	4.6	4.2	4.1	4.0
Tangerines	.1	.2	.3	.5	.8	.8	.4
Hay	.3	.3	.2		.2		.2
Other crops	2.1	3.0	1.8	1.1	.6	.7	1.6
Total crops	24.2	25.5	26.4	26.2	26.7	26.9	26.0

Table 13 shows that the caretaker farms, as a general rule, were smaller both in total farm acreage and acreage in grove than were the owner-operated farms. Another difference in the organization of the two types was the absence of crops other than fruit on the caretaker farms. Among the 13 largest farms of the owner-operated type, only 3 had more than 25 acres of bearing fruit, and of these 3, 1 had 65.8 acres, 1 had 78 acres, and 1 had 210 acres. Only 2 of the caretaker farms had more than 30 acres of bearing fruit. One of the 2 had 40.7 acres and the other had 51.4 acres.

TABLE 13.—*Distribution of land on 100 citrus fruit farms in Polk County, Fla., classified by type of management and size of groves, average 1917–1922*

Item	Average distribution of acreage on—						
	Owner-operator farms			Caretaker farms			All farms
	1 to 12 acres	13 to 24 acres	25 acres and over	1 to 6 acres	7 to 12 acres	13 acres and over	
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Groves reporting	13	12	13	12	36	14	100
Farm area:							
Tillable land:							
Bearing fruit—	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Grapefruit	3.5	9.2	18.1	2.0	4.7	12.5	7.6
Oranges	4.6	10.2	35.0	2.6	4.7	9.3	9.7
Tangerines	.5	1.1	2.4	.1	.4	1.5	.9
Other fruit	----------	----------	----------	----------	----------	----------	[1].2
Total	8.6	20.5	55.5	4.7	9.8	23.3	18.4
Nonbearing fruit—							
Grapefruit	.8	1.7	5.3	.2	.6	1.7	1.5
Oranges	2.7	8.6	10.2	1.1	1.6	4.3	4.0
Tangerines	.7	.6	.3	----------	.4	.9	.4
Total	4.2	10.9	15.8	1.3	2.6	6.9	5.9
Corn—							
First crop	3.4	.8	3.4	----------	.1	----------	1.0
Second crop	.7	.9	1.2	----------	----------	----------	.3
Interplanted	.7	.5	.6	----------	----------	----------	.2
Hay—							
First crop	.3	.4	.6	----------	----------	----------	[1].2
Second crop	2.8	6.9	11.3	----------	----------	----------	2.6
Interplanted	1.0	2.3	5.2	----------	----------	----------	1.0
Pasture	3.1	1.7	3.3	.2	1.1	1.3	1.6
Other crops—							
First crop	1.4	.5	2.0	.1	----------	.2	.5
Second crop	.9	.9	2.7	----------	----------	----------	.6
Interplanted	2.8	.8	1.9	----------	----------	----------	.4
Total tillable	21.0	34.8	80.6	6.3	13.6	31.7	27.6
Woodland	13.7	6.3	26.5	1.5	2.5	18.4	9.7
Waste	4.6	2.3	15.1	.3	1.1	2.9	3.7
Total farm area	39.3	43.4	122.2	8.1	17.2	53.0	41.0

[1] Average for 4 years.

NUMBER OF TREES TO THE ACRE

One of the very important considerations in the organization of a grove lies in the number of trees to be planted per acre. A classification of groves by blocks according to the number of trees per acre is shown in Table 14. The space which the trees will occupy at maturity is often the gauge for the distances to be left between trees at the time of setting. Probably a majority of the groves planted in recent years have less than 70 trees per acre. Many of the older and thickly planted groves present a rather unfavorable picture to-day with their dense umbrella-shaped tops excluding sunlight from the ground and lower limbs, thus preventing growth of cover crop and causing the lower limbs to die.

This condition is not universally an argument against thick planting, for it is the result of faulty management. The large yields and net income from thickly-planted groves have often caused the grower to be reluctant to remove some of the trees. Many growers are now planting their trees in such a way that alternate trees may be removed when necessary, leaving the grove in a symmetrical and workable condition. It costs a little more in the beginning to buy the extra trees and there is some expense in removing them, but the additional returns for a period of 10 years from approximately 40 trees per acre above the normal number that can be cared for at maturity is a matter that merits serious consideration. The removed trees may be replanted and, if properly done, will produce fruit again within a few years.

TABLE 14.—*Distribution of groves of fruit trees by numbers of trees set per acre*

Number of trees per acre	Groves classified by kind			
	Total	Oranges	Grapefruit	Tangerines
	Number	*Number*	*Number*	*Number*
50 and less	72	29	31	12
51 to 60	54	20	25	9
61 to 70	29	14	11	4
71 to 80	33	12	15	6
81 to 90	18	7	5	6
Over 90	21	10	8	3
Total	227	92	95	40
Average number of trees per acre for all groves	64			

The average number of trees per acre on the 100 groves was 64. The lowest number of trees per acre in any grove was 32 and the highest number was 117. The evidence is not entirely conclusive but there is no reason to doubt that on the whole growers would profit by having a greater number than the average of 64 trees per acre while the trees are young. Apparently no more ground space is necessary than that needed for the tree to grow in, leaving sufficient light and room for cover crops and convenience of operation. It pays to use all space to the limit. In fact, there is a strong tendency for the yield per tree to be greater where the trees are set closer together.

VARIETIES OF CITRUS FRUIT

As important as the number of trees per acre are the varieties of the different kinds of fruit. No statement can be made with regard to grapefruit and tangerines, because the growers' knowledge of these kinds of fruit was too indefinite to classify. In the case of 73 of the orange groves it was possible to determine rather definitely the varieties of oranges grown. Of a total of 52,036 trees, 30,125 were Valencia, 12,457 were Pineapple, 5,071 were seedlings, 1,140 were Parson Brown, 592 were Washington Navel, and 2,651 were made up of miscellaneous varieties.

The importance of variety selection in orange trees is indicated in the six-year average prices received. Those growers that had more than 50 per cent of their orange settings in Valencias averaged net to the grower on the tree, $3.01 per box; those having less than 50 per cent of their orange settings in Valencias averaged $2.53 per box on the tree. (These prices are net to the grower with harvesting, packing, marketing, and all other costs deducted except the cost of production. The prices are the weighted average price.)

On the other hand the Valencia trees produced 1.96 boxes per tree whereas the trees of the other varieties, principally Pineapple, produced 2.57 boxes per tree. On a tree basis, therefore, the income from Pineapples was greater than from Valencias. The principal purpose of having more than one variety of fruit, however, is to guard against low prices which might occur during a part of the season.

MACHINERY AND EQUIPMENT

The machinery and equipment necessary to operate a grove farm is small in amount and simple in character. For most farms a wagon, plow, harrow, and sprayer with a few pruning hooks and shears is about the extent of actual needs. Table 15 gives the number of farms reporting different kinds of equipment and the number of implements per farm reporting. Not all the farm operators owned mowers and sprayers. In some groves weeds were not cut but were dragged down with the harrow and then plowed under. Many growers hire the spraying done by neighbors and especially was this true among those who had small groves. Only four growers possessed tractors at the conclusion of the study in 1922. Of the four, three used them to supplement animal power in cultivating and one used tractor power entirely in cultivating.

WORK STOCK

Thirty-seven of the 100 farmers kept work stock. The total number for the 37 was 74 head, of which 16 were horses and 58 were mules. The average number of work stock per grove was 2 head, but the actual count was as follows: 17 groves had 1 head each, 14 groves had 2 each, 2 groves had 3 each, 3 groves had 4 each, and 1 grove had 10 head of work stock.

TABLE 15.—*Implements used by Polk County citrus-fruit growers and the number of groves of the 100 studied that possessed such as regular equipment, 1917–1922*

Kinds of machinery	Farms reporting	Average per farm reporting	Kinds of machinery	Farms reporting	Average per farm reporting
	Number	*Number*		*Number*	*Number*
1-horse wagon	39	1.05	Planet Junior	33	1.18
Pleasure wagon	28	1.11	Gasoline engine	12	1.33
Heavy wagon	17	1.24	Fertilizer distributer	5	1.00
1-horse plow	43	2.51	Mowing machine	24	1.21
2-horse plow	16	1.19	Cane mill	2	1.00
Acme harrow	48	1.56	Cane vat	2	1.00
Disk harrow	14	1.14	Sprayer	18	1.94
Stalk cutter	1	1.00	Manure spreader	1	1.00
Plow stock and sweeps	13	1.54	Hay press	1	1.00
1-horse cultivator	9	1.33	Tractor	4	1.00

CAPITALIZATION OF FRUIT FARMS

"Capitalization" as used here refers to the inventory value of real estate, livestock, machinery and equipment, feed and supplies, and average amount of cash kept on hand for operating the business. It would be difficult to find an agricultural community with such ranges in total capitalization as are found among the citrus groves of Polk County, Fla. The capitalization ranged from $4,645 for a 3.5-acre grove to $345,760 for a 210-acre grove. The six-year (1917–1922) average capitalization per grove for the 100 groves was $31,542, of which $29,889 was in real estate and $1,653 was in livestock, machinery, irrigation equipment, feed and supplies, and cash. (Table 16.)

The capitalization per grove doubled in amount during the period of this study. This increase was due primarily to two factors: (1) The increase in the acreage of bearing fruit, and (2) the increase in the market value per acre of bearing grove. This increase in market value was caused by exceptionally good fruit prices. The acreage per grove increased from 14.4 acres to 21, and the value per acre from $1,455 in 1917 to $1,989 in 1922. Increases took place in the other elements also, particularly in dwellings, other buildings, machinery and cash. The capitalization varies with the size of the grove, type of management, producing capacity and location. An endeavor was made to value the grove as a producing plant and, so far as possible, to eliminate that part of the value caused by external influences, such as desirable residential location near one of the many beautiful lakes or near one of the many small cities.

TABLE 16.—*Capitalization of 100 citrus-fruit farms, Polk County, Fla., 1917–1922*

Item	Value per farm						
	1917	1918	1919	1920	1921	1922	Average
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Total capitalization	20,656	21,702	28,698	35,906	40,512	41,776	31,542
Land	17,957	18,814	25,300	31,885	36,133	37,334	27,904
Dwelling	1,167	1,194	1,298	1,548	1,775	1,868	1,475
Other buildings	429	421	484	535	585	606	510
Total real estate	19,553	20,429	27,082	33,968	38,493	39,808	29,889
Livestock	223	222	224	277	267	246	243
Machinery	114	121	156	243	362	369	228
Irrigation equipment	141	140	139	137	139	139	139
Feed and supplies	55	68	98	46	44	41	59
Cash	570	722	999	1,235	1,207	1,173	984
Total other	1,103	1,273	1,616	1,938	2,019	1,968	1,653
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Land	87.0	86.7	88.2	88.8	89.2	89.4	88.5
Dwelling	5.6	5.5	4.5	4.3	4.4	4.5	4.7
Other buildings	2.1	1.9	1.7	1.5	1.4	1.4	1.6
Total real estate	94.7	94.1	94.4	94.6	95.0	95.3	94.8
Livestock	1.1	1.0	.8	.8	.7	.6	.8
Machinery	.6	.6	.5	.7	.9	.9	.7
Irrigation equipment	.7	.7	.5	.4	.3	.3	.4
Feed and supplies	.2	.3	.3	.1	.1	.1	.2
Cash	2.7	3.3	3.5	3.4	3.0	2.8	3.1
Total other	5.3	5.9	5.6	5.4	5.0	4.7	5.2

In the owner-operator group of groves the total capitalization varied from $19,841 for those groves having between 1 and 12 acres to $88,123 for those groves having more than 25 acres of bearing grove. (Table 17.) The caretaker groves, on the average, were smaller in size than the owner-operator classes and as a consequence they appear in different classifications as to size. For the smallest groves in the caretaker class, from 1 to 6 acres, the average total capitalization per grove averaged $10,371 and for those groves having over 13 acres in bearing grove the average capitalization was $38,570. Similar sized groves in the owner-operator type of organization were capitalized slightly higher because more buildings, work stock, machinery and equipment, and feed and supplies were on these farms.

TABLE 17.—*Summary of capitalization per grove, by size and by type of management, for 100 groves in Polk County, Fla., average 1917–1922*

Item	Average all groves	Owner-operator groves			Caretaker groves [1]		
		1 to 12 acres	13 to 24 acres	25 acres and over	1 to 6 acres	7 to 12 acres	13 acres and over
Groves reporting	100	13	12	13	12	36	14
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Total capitalization	31, 542	19, 841	38, 721	88, 123	10, 371	17, 265	38, 570
Land	27, 904	15, 759	34, 042	78, 477	8, 959	15, 482	35, 140
Dwellings	1, 475	2, 220	1, 678	2, 342	958	1, 091	1, 227
Other buildings	510	427	710	1, 823	130	183	370
Total real estate	29, 889	18, 406	36, 430	82, 642	10, 047	16, 756	36, 737
Livestock	243	481	426	852	18	23	60
Machinery	228	310	374	878	6	33	111
Irrigation equipment	139	38	167	479	47	3	323
Feed and supplies	59	109	108	218	1	5	8
Cash	984	496	1, 216	3, 054	252	445	1, 331
Total other	1, 653	1, 435	2, 291	5, 481	324	509	1, 833

[1] Of those indicated as caretaker groves work stock was kept on three and several had dwellings for the caretaker and his family. When the caretaker lived on the place he usually kept chickens and often a cow or two.

The productivity of a grove had much to do with its stated value; that is, if the yield per acre was high the value per acre was usually correspondingly high. Since the yield per acre was in close relationship to the number of trees per acre and the age of the trees, the actual physical accessories to the land—more trees and larger trees—had much to do with the variation in the value per acre of grove property on different farms. Typical examples of the variation in acre values may be cited as follows: A grove with a yield of 170 boxes of fruit per acre was valued at $1,984 per acre, whereas another grove with a yield of 426 boxes per acre was valued at $3,479 per acre.

An important item of capitalization is the average cash on hand necessary to operate the grove. Many growers have found themselves in serious difficulties because this important matter was not fully realized. It cost on the average $148 in cash per acre to operate a grove a year, an amount which had to be used and therefore had to be in hand or available at the start of the year's work. There is small opportunity to reduce the cost on a grove without bringing great injury to it. Fertilizer must be applied, crop or no crop, and the usual cultural work must be performed. As these two items form a very large part of the cost, it is apparent that the amount of capital carried in cash can not be reduced to any appreciable extent.

GROVE OPERATIONS AND PRACTICES

The various grove operations follow regular cycles which are established by the alternating dry and wet seasons and by the demands of the trees in their various stages of fruiting. During the rainy season very little cultural work is done and cover crops, usually a volunteer growth of beggarweed, are allowed to grow. In most cases the weeds are mowed or dragged down and plowed under or are plowed under without any previous destruction (fig. 3).

Following the fall plowing and harrowing, the trees are given an application of fertilizer. After the fall fertilizing, it is customary to let the soil rest until the second application of fertilizer in February. The spring application of fertilizer is followed with rather constant harrowing until June when, after the third application of fertilizer, the grove is laid by with a harrowing for the rainy season. Most of the growers hoe around their trees twice a year, once in the early fall and again in the early part of the summer.

Other principal operations are pruning, hauling brush, and spraying. Most of the growers prune and remove brush in the winter and spring but many do summer pruning. The date of pruning is controlled in a measure by the varieties of fruit. If the trees are pruned properly when young there is little to be done when they reach maturity, except to keep out dead and diseased wood. Circumstances alter the spraying schedule to such an extent that it is next to impossible, except within periods of considerable latitude in time, to state a definite schedule. Probably most of the spraying comes in March, May, June, and September. Thus, although the care of the grove requires only a part of the total number of working days in a year, it is necessary to do some work in practically every month.

Disking is a practice used by only a few growers, and is usually done in the fall, although a few disk in the spring in place of the other types of harrowing. Banking is another operation not frequently practiced, in the groves studied, because most of the bearing trees were beyond the age when such precautions were thought necessary to prevent frost damage.

The methods of caring for groves on the 100 farms studied in Polk County did not differ greatly. The operations and equipment were practically standardized but there was great variation of intensity in the different practices among the growers; for example, the number of harrowings per grove per year ranged from 2 to 18, with an average of about 9 for all farms.

Some of the growers harrowed more in 1922 than was their usual custom because of the drought that year. In Table 18 are shown the operations typical on 100 groves in Polk County for the season of 1922. The average results of the various operations on a large number of groves give a clear idea of the amount of labor put on most groves in this district. On the average, the actual year's work in a grove of 20 acres required 182 days of man labor and 108 days of horse labor. A great many of the grove owners practiced professions elsewhere and did no actual manual labor in their groves but hired their work done and thereby provided work for caretakers and growers whose time was not fully occupied in their own groves.

TABLE 18.—*Labor practices, by operations, on 100 groves in Polk County, Fla., averages for those performing operations in 1922*

Operations	Average crew		Times over	Acres per day	Total days per acre		Percentage of farmers reporting use
	Man	Horse			Man	Horse	
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Per cent*
Plowing	1.0	1.1	1.2	1.6	0.7	0.8	95
Harrowing	1.0	1.8	9.8	6.4	1.3	2.4	100
Applying fertilizer	2.6	1.7	2.7	11.4	.7	.4	98
Pruning	1.1	----------	1.0	.3	3.2	----------	99
Hauling brush	1.2	1.3	1.0	2.8	.5	.5	99
Hoeing	1.0	----------	1.6	1.1	1.4	----------	100
Spraying	2.6	2.2	4.1	7.1	1.4	1.3	93
Mowing	1.0	1.9	1.3	6.2	.2	.3	50

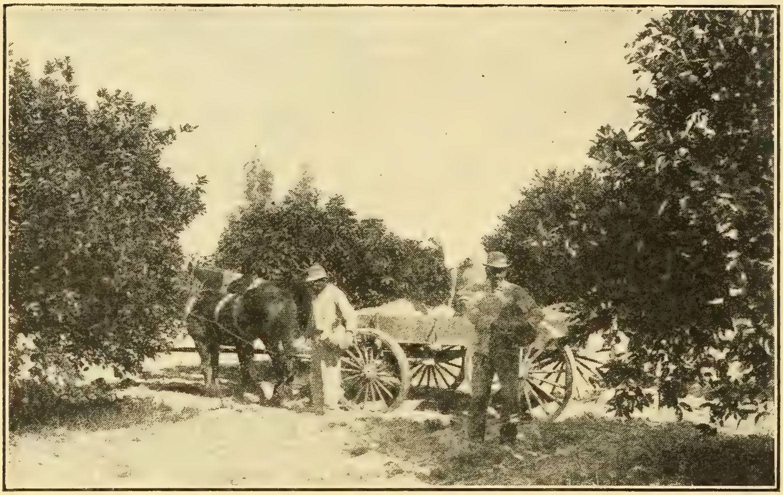

FIG. 4.—Fertilizer is applied two or three times a year to the bearing trees. The distributing is done by hand, making it easy to vary the rate of application according to the condition and the quantity of fruit set on the individual trees

The trees with better than normal yields received an application of fertilizer greater by about 10 pounds than the average application for all trees. The grower applies fertilizer with a view to the effect on the general condition of the tree (fig. 4). An overdose of fertilizer makes a tree sick. Therefore, from the standpoint of intensive use of fertilizer the growers on this particular type of soil are not guided by diminishing returns so much as by judicious increases in the use of fertilizer in order not to reach that point where an additional quantity of fertilizer will create an unhealthy condition of the tree. For trees above 10 years in age, in good condition, 50 pounds of fertilizer per tree of a 3–8–8 (nitrogen-phosphoric acid-potash) mix was regarded on the average by the more successful growers to be about the right quantity to use.

The average quantity of fertilizer used per tree per year on bearing groves was influenced very little by the age of the tree or the variety of fruit. In Tables 19, 20, and 21, summaries of fertilizer applications per tree are given for the different ages of fruit by varieties. Grapefruit averaged a pound more fertilizer per tree than oranges, and tangerines averaged 6 pounds more per tree than oranges. There is little evidence that there was any strict practice among the growers as to the quantity of fertilizer best suited to the needs of trees at various ages. With respect to the use of fertilizer and yields, the evidence shows that higher-than-average yields are associated with a higher-than-average application of fertilizer per tree. It was not uncommon for growers to adjust somewhat the rates of application in the February and June fertilizings to the prospects of the crop in their groves.

The individual trees, in a grove with trees of the same age and of the same variety of fruit, vary considerably in physical condition and fruit-carrying ability and the intelligent grower adjusts the quantity of fertilizer for each tree according to the needs of the individual tree.

TABLE 19.—*Distribution of bearing orange groves by age groups with quantity of fertilizer used per tree annually, and yield per tree; average 1917–1922, Polk County, Fla.*

Age classes	Average age of trees	Trees	Groves	Fertilizer per tree	Yield per tree	Age groups classified by pounds of fertilizer per tree per annum	Groves	Fertilizer per tree	Yield per tree
	Years	*Number*	*Number*	*Pounds*	*Boxes*		*Number*	*Pounds*	*Boxes*
All classes	15	57,592	92	42	2.27	Less than 20 pounds	4	14	2.57
						21 to 30 pounds	11	26	1.88
						31 to 40 pounds	29	36	2.00
						41 to 50 pounds	30	45	2.51
						Over 50 pounds	18	59	3.57
26 years and over	28	2,040	6	44	2.89	Less than 20 pounds	1	18	1.05
						21 to 30 pounds	1	23	3.81
						31 to 40 pounds	1	40	3.31
						41 to 50 pounds	1	45	2.39
						Over 50 pounds	2	68	3.56
21 to 25 years	23	10,605	15	42	2.56	Less than 20 pounds	--------	--------	-------
						21 to 30 pounds	3	25	1.83
						31 to 40	3	37	3.01
						41 to 50 pounds	7	46	2.66
						Over 50 pounds	2	68	4.60
16 to 20 years	18	7,755	15	48	2.68	Less than 20 pounds	--------	--------	-------
						21 to 30 pounds	3	26	.84
						31 to 40 pounds	2	37	3.88
						41 to 50 pounds	6	47	2.68
						Over 50 pounds	4	72	3.44
11 to 15 years	13	28,200	30	40	2.17	Less than 20 pounds	3	13	2.31
						21 to 30 pounds	2	27	1.64
						31 to 40 pounds	12	36	2.03
						41 to 50 pounds	6	45	2.59
						Over 50 pounds	7	58	3.49
6 to 10 years	8	8,996	26	40	1.69	Less than 20 pounds	--------	--------	-------
						21 to 30 pounds	2	27	1.53
						31 to 40 pounds	11	35	1.08
						41 to 50 pounds	10	44	2.22
						Over 50 pounds	3	53	1.67

TABLE 20.—*Distribution of bearing grapefruit groves by age groups with quantity of fertilizer used per tree annually and yield per tree; average 1917–1922, Polk County, Fla.*

Age classes	Average age of trees	Trees	Groves	Fertilizer per tree	Yield per tree	Age groups classified by pounds of fertilizer per tree per annum	Groves	Fertilizer per tree	Yield per tree
	Years	*Number*	*Number*	*Pounds*	*Boxes*		*Number*	*Pounds*	*Boxes*
All classes	15	44, 745	95	43	3. 06	Less than 20 pounds	4	14	4. 03
						21 to 30 pounds	9	26	2. 76
						31 to 40 pounds	29	36	2. 40
						41 to 50 pounds	33	45	3. 16
						Over 50 pounds	20	63	3. 79
21 and over	24	2, 970	18	44	3. 07	Less than 20 pounds	1	18	2. 72
						21 to 30 pounds	2	25	4. 32
						31 to 40 pounds	4	38	2. 16
						41 to 50 pounds	7	46	3. 06
						Over 50 pounds	4	62	3. 72
16 to 20 years	18	5, 355	15	50	3. 44	Less than 20 pounds	----	----	----
						21 to 30 pounds	2	26	2. 26
						31 to 40 pounds	2	37	4. 65
						41 to 50 pounds	6	46	3. 80
						Over 50 pounds	5	70	3. 10
11 to 15 years	13	22, 876	38	42	3. 18	Less than 20 pounds	2	10	3. 97
						21 to 30 pounds	2	27	3. 38
						31 to 40 pounds	15	36	2. 48
						41 to 50 pounds	12	46	3. 14
						Over 50 pounds	7	64	4. 27
7 to 10 years	9	12, 600	24	39	2. 69	Less than 20 pounds	1	18	4. 45
						21 to 30 pounds	3	27	2. 03
						31 to 40 pounds	8	34	1. 74
						41 to 50 pounds	8	44	2. 93
						Over 50 pounds	4	54	3. 44

TABLE 21.—*Distribution of bearing tangerine groves by age groups with quantity of fertilizer used per tree annually and yield per tree; average 1917–1922, Polk County, Fla.*

Age classes	Average age of trees	Trees	Groves	Fertilizer per tree	Yield per tree	Age groups classified by pounds of fertilizer per tree per annum	Groves	Fertilizer per tree	Yield per tree
	Years	*Number*	*Number*	*Pounds*	*Boxes*		*Number*	*Pounds*	*Boxes*
All classes	16	5, 960	40	48	2. 53	Less than 30 pounds	5	19	0. 98
						31 to 40 pounds	6	37	1. 95
						41 to 50 pounds	15	46	2. 85
						51 to 60 pounds	7	54	3. 25
						Over 60 pounds	7	77	2. 88
21 years and over	25	2, 968	14	51	2. 99	Less than 30 pounds	2	22	. 64
						31 to 40 pounds	----	----	----
						41 to 50 pounds	5	47	3. 11
						51 to 60 pounds	3	52	3. 44
						Over 60 pounds	4	68	2. 93
16 to 20 years	18	364	4	57	2. 46	Less than 30 pounds	----	----	----
						31 to 40 pounds	1	33	1. 80
						41 to 50 pounds	2	44	3. 08
						51 to 60 pounds	----	----	----
						Over 60 pounds	1	107	1. 68
11 to 15 years	13	2, 008	8	43	2. 07	Less than 30 pounds	1	3	1. 79
						31 to 40 pounds	3	38	1. 99
						41 to 50 pounds	1	48	1. 60
						51 to 60 pounds	2	58	2. 77
						Over 60 pounds	1	64	3. 77
10 years and under.	8	602	14	46	1. 84	Less than 30 pounds	2	23	1. 36
						31 to 40 pounds	2	37	. 88
						41 to 50 pounds	7	45	1. 93
						51 to 60 pounds	2	55	2. 03
						Over 60 pounds	1	96	2. 65

The analyses of the fertilizer used in 76 groves in 1922 was obtained. A majority of the 76 groves were fertilized three times each year, but of this number eight growers made no spring application, four no summer application, and seven no fall application.

There was considerable difference of opinion among growers as to the grade of fertilizer to use for the best results. The soil and condition of the trees had much to do with the choice, but a large part of the variation was due to the difficulty of determining what was best. There was no difference in the fertilizer analysis because of the kind of fruit, the growers using the same kind for oranges, grapefruit, and tangerines. Table 22 shows a distribution of the orange groves according to the percentage of the various elements of the mixtures used in the spring, summer, and fall applications.

The variation in the percentage of the nitrogen and phosphoric acid materials was not so great as the variation in the percentage of potash used. There was a tendency to use more nitrogen in the spring than in the summer and fall applications; 3 to 4 per cent of nitrogen was used in the spring, whereas in the other two applications the majority of the growers used 3 per cent of nitrogen. Most of the growers used from 6 to 8 per cent of phosphoric acid in the mixtures for all applications. There was considerable difference in the percentage of potash used in the mixtures. The most common amounts used were: Spring, 5 per cent; summer, 5 per cent; and fall, 10 per cent. The tendency was toward a gradual increase as the season advanced.

TABLE 22.—*Number of growers using various percentages of nitrogen, phosphoric acid, and potash for spring, summer, and winter fertilizing, in 1922*

Season	Most usual analysis	Nitrogen		Phosphoric acid		Potash	
		Percentage	Total growers using	Percentage	Total growers using	Percentage	Total growers using
		Per cent	*Number*	*Per cent*	*Number*	*Per cent*	*Number*
Spring	3-8-5	2	1	3	1	2	1
		3	32	4	1	3	17
		4	28	5	1	4	2
		5	4	6	12	5	21
		6	3	7	5	6	9
		---------	---------	8	45	7	3
		---------	---------	9	2	8	8
		---------	---------	15	1	10	7
Summer	3-8-5	2	4	3	1	3	6
		2	4	4	2	4	1
		3	50	5	1	5	21
		4	14	6	20	6	13
		6	4	7	2	7	3
		---------	---------	8	44	8	17
		---------	---------	9	1	10	11
		---------	---------	15	1	---------	---------
Fall	3-8-10	½	1	3	1	2	1
		2	9	4	2	3	3
		3	45	5	2	4	2
		4	10	6	17	5	15
		5	1	7	5	6	5
		6	1	8	42	7	6
		---------	---------	---------	---------	8	16
		---------	---------	---------	---------	10	20
		---------	---------	---------	---------	12	1

The quantity of spray material used per tree varies as much if not more than the quantity of fertilizer used per tree. The ill effects of too little fertilizer as compared with the use of too little spray is perhaps more apparent to the casual observer because of radical change in the appearance of the foliage where plant food is deficient; but viewed with respect to the yield and quality of the fruit, the information obtained seems to indicate that spraying is quite as important as fertilizing.

Information relative to the analysis of the sprays used was not obtained in all cases. It was believed, however, that the sprays used by most of the growers did not vary so much in analysis or in quality of material as in the quantity used and number of sprayings. Consequently, it was believed that value of material used represented a method of measurement which reflected rather accurately, on the whole, the quantity used. Using the value of spray material per tree, there was a range in the six-year average amount used per tree in 90 orange groves (Table 23) of from 2 mills to 25 cents, with a majority using from 4 to 15 cents worth of material per tree, annually.

TABLE 23.—*Distribution of bearing groves and acreage of bearing trees, by cost of spray material per tree*

Cost per tree of spray material	Oranges		Grapefruit		Tangerines	
	Groves	Acres	Groves	Acres	Groves	Acres
	Number	*Number*	*Number*	*Number*	*Number*	*Number*
6 cents and less	38	502	38	277	14	45
7 to 14 cents	33	218	35	172	16	30
15 cents and over	19	122	20	120	10	10
Total	90	842	93	569	40	85

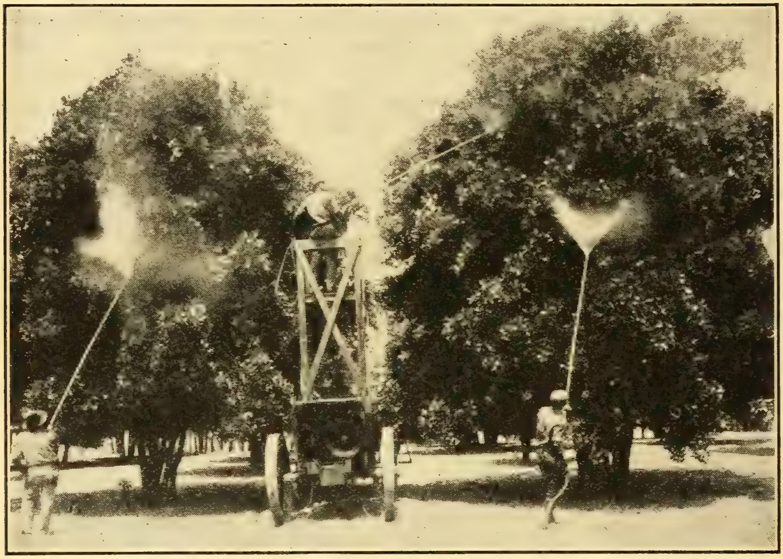

FIG. 5.—Spraying is necessary in the growing of thrifty citrus-fruit trees and in the production of clean, bright fruit. The most common enemies to be fought in the groves studied were white fly, scab, rust mite, thrips, red spider, and melanose

It was difficult to determine the net effect of the quantity of spray material used on yields and price of fruit, because of the variations in age and kinds of fruit, quantity of fertilizer used, kind of soil, and other factors. A study of the data indicates, however, that the growers who sprayed thoroughly had higher yields than the average and that cleaner fruit reflected a better price (fig. 5). In 1922, the average quantities of concentrated spray materials used per acre per annum were, lime-sulphur, 13.8 gallons, and oil emulsion, 6.6 gallons.

COST OF PRODUCTION OF CITRUS FRUIT

Good management is reflected in the methods and practices of those whose profits over a period of years are satisfactory. The grower who hopes for success must know the details concerning his business, especially the factors affecting his profits. These factors are many and are constantly increasing, and the grower must do much testing to discern whether or not he is continuing along profitable lines. Much of this testing may be done with the aid of the cost-of-production data. Every grower should know at the outset that to be successful he must produce as cheaply as possible and still maintain a high yield of good variety and good quality fruit.

The methods of analysis used in this bulletin were considered the most practical way of getting the important information. The cost system here used represents a minimum of effort in gathering and preparation and offers a maximum of useful information. The charges for picking, hauling, and packing the fruit are borne by the buyer and not included in production costs.

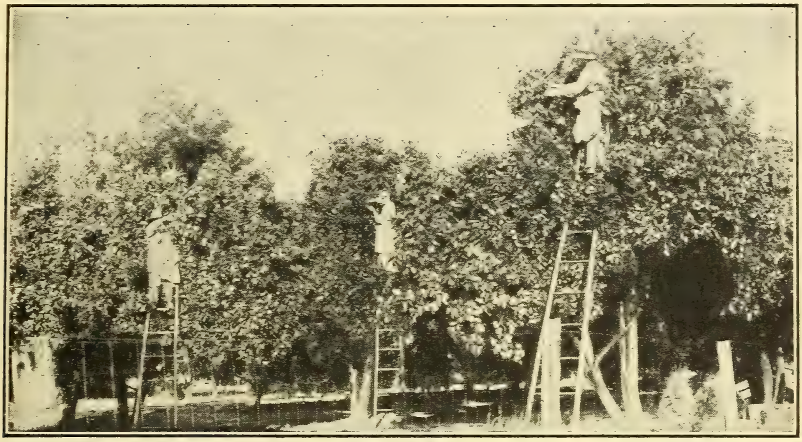

FIG. 6.—Fruit is harvested by the purchaser (a growers' association or a private buyer). The grower is thus relieved of the problem of harvesting and marketing his fruit and the price he receives is net price on the tree

The costs were divided into two main groups, cash and noncash. In the cash cost group are placed all actual cash expenditures for the year and in the noncash group are those items of depreciation, value of grower's and the grower's family labor, and interest on capitalization (Table 24). In arriving at the net cost of producing fruit, the cost of caring for young groves and receipts from sources other than fruit were deducted from the total cost of operating the farm. The first deduction shown in Table 24 is the cost of caring for young groves. This figure represents that part of the total expenditures for labor and materials put on the young grove the value of which remains on the place in the form of added capital. The value of the young grove was deducted from the total capitalization and interest was figured at 8 per cent on the remainder. The other deductions made were for receipts from other crops and for outside labor performed by the operator.

TABLE 24.—*Summary of costs per farm for 100 groves, Polk County, Fla., 1917–1922*

Items of cost	Cost per farm						
	1917	1918	1919	1920	1921	1922	Average
Cash costs:	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Labor	442	561	779	1,027	1,085	1,032	821
Fertilizer and bluestone	641	994	1,359	1,730	1,512	1,428	1,277
Spray material	39	52	91	110	118	130	90
Taxes and insurance	90	151	197	241	277	298	209
Repairs—							
Buildings	28	27	29	30	30	30	29
Machinery	12	12	14	21	16	21	16
Fences	7	8	9	9	9	10	9
Feed, horseshoeing, and veterinary	111	140	162	187	157	141	150
Fuel and oil	5	9	9	18	17	27	14
Auto for farm use	7	12	22	61	66	71	40
Miscellaneous	18	25	34	46	57	67	41
Total cash costs	1,400	1,991	2,705	3,480	3,344	3,255	2,696
Noncash costs:							
Reserves for depreciation—							
Buildings	58	57	62	71	80	86	69
Equipment	22	25	36	65	67	69	47
Operator's labor	364	380	529	558	531	509	479
Family labor	7	9	20	5	16	18	12
Total noncash costs	451	471	647	699	694	682	607
Total costs	1,851	2,462	3,352	4,179	4,038	3,937	3,303
Credit deductions:							
Care of young groves	286	243	200	177	134	168	201
Receipts from other crops	136	85	53	64	27	32	66
Miscellaneous	121	157	130	103	64	26	100
Total deductions	543	485	383	344	225	226	367
Net cost, without interest	1,308	1,977	2,969	3,835	3,813	3,711	2,935
Interest on capitalization, 8 per cent	1,447	1,561	2,143	2,736	3,124	3,214	2,371
Net costs per grove (with interest)	2,755	3,538	5,112	6,571	6,937	6,925	5,306
Net cost per acre, all fruit:							
With interest	191	222	281	335	337	330	288
Without interest	91	124	163	196	185	177	160
Yield per acre:	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*
All fruit	114	138	171	224	164	185	166
Oranges	109	134	184	194	142	146	152
Grapefruit	120	145	155	259	181	234	182
Net cost per box:	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Oranges, with interest	1.75	1.66	1.53	1.73	2.73	2.26	1.89
Oranges, without interest	.84	.93	.89	1.01	1.30	1.21	1.05
Grapefruit, with interest	1.59	1.52	1.81	1.29	1.86	1.41	1.58
Grapefruit, without interest	.76	.86	1.08	.76	1.02	.76	.88

The costs for a great many of the groves are distributed over different kinds of fruit. That is, many of the growers had oranges, grapefruit, and tangerines interplanted for which it would be practically impossible to get separate costs. But since the average practice of all the growers in cultivating, spraying, and fertilizing showed little variation in costs and in quantities, the groves have been given the same weight per acre regardless of kind of fruit, the cost per box then being obtained by dividing the acre cost respectively by the per acre yields of the different kinds of fruit.

The cost per acre of producing citrus fruit in Polk County increased from $191 in 1917 to $337 in 1921 and then decreased to $330 in 1922. The cost per acre over the six-year period has advanced $139 or 73 per cent. The items most important in the cause of the increase in the cost per acre were: Fertilizer the cost of which went from $44.51 per acre in 1917 to $68 in 1922; labor, the cash cost of which went from $30.69 in 1917 to $49.14 in 1922; and interest on capitalization which rose from $100.48 in 1917 to $153.05 per acre in 1922. Other items show even a higher percentage of change over the period, but the absolute amount of the change caused by the advance in these other cost factors was inconsiderable (Table 25). A detailed list of operating expenses of the fruit farms is shown in Table 25.

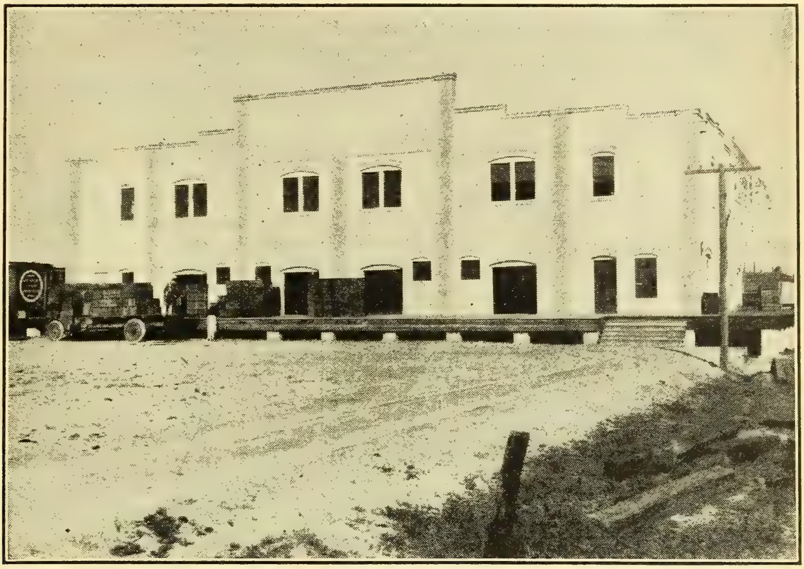

FIG. 7.—Grading and packing of fruit in large community packing houses tends to a more uniform grade and pack. Most of the fruit grown on the farms studied was sold through the branches of the Florida Citrus Growers' Association

TABLE 25.—*Distribution of expenses on 100 citrus-fruit farms, Polk County, Fla., 1917–1922*

Items of expense	Per farm—						
	1917	1918	1919	1920	1921	1922	Average
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Fertilizer	641	994	1,355	1,712	1,494	1,405	1,267
Regular labor	138	155	246	575	623	567	384
Extra labor	304	406	533	452	462	465	437
Taxes	80	139	185	227	258	281	195
Feed bought, grain	100	130	147	165	139	131	135
Spray material	39	52	91	110	118	130	90
Depreciation on dwelling	36	35	38	45	53	57	44
Automobile for farm use	7	12	22	61	66	71	40
Machinery depreciation	14	15	27	56	58	57	38
Depreciation, other buildings	22	22	24	26	27	29	25
Repair dwelling	19	18	21	23	22	22	21
General expenses	7	11	10	10	27	43	18
Repair machinery	12	12	14	21	16	21	16
Fuel and oil	5	9	9	18	17	27	14
Insurance	10	12	12	14	19	17	14
Family labor	7	9	20	5	16	18	12
Depreciation, irrigation	8	10	9	9	9	12	10
Bluestone	--------	--------	4	18	18	23	10
Repairs, fences	7	8	9	9	9	10	9
Repairs, other buildings	9	9	8	7	8	8	8
Seed bought	9	11	5	14	8	3	8
Feed bought, hay	6	3	6	11	10	4	7
Horseshoeing	3	6	7	8	7	3	6
Other machine work hired	2	3	5	4	12	--------	4
Telephone	--------	--------	5	7	6	6	4
Breeding fees and veterinary	2	1	2	3	1	3	2
Decrease feed and supplies	--------	--------	9	11	4	15	6
Total expense	1,487	2,082	2,823	3,621	3,507	3,428	2,824

A summary of the costs for the citrus groves under different types of management and for groves of various sizes within these types is given in Table 26. On the whole, the costs per acre were lower on the caretaker groves of the small size than for the similar group under owner management and were higher on the caretaker groves of large size than on the corresponding size in the owner-operator

TABLE 26.—*Summary of costs per farm, by size of grove and type of management, 100 citrus-fruit groves, Polk County, Fla., average 1917–1922*

Items of cost	All groves	Owner-operator groves			Caretaker groves		
		1 to 12 acres	13 to 24 acres	25 acres and over	1 to 6 acres	7 to 12 acres	13 acres and over
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Number of farms	100	13	12	13	12	36	14
Cash costs:	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Labor	821	368	957	2, 119	183	473	1, 363
Fertilizer	1, 277	550	1, 377	3, 693	378	698	1, 887
Spray material	90	40	124	202	25	57	145
Taxes and insurance	209	131	222	602	80	100	296
Repairs—							
Buildings	29	22	27	78	15	21	25
Machinery	16	9	15	85	--------	2	8
Fences	9	7	8	16	3	7	13
Feed, horseshoeing, and veterinary	150	253	306	489	13	17	58
Fuel and oil	14	8	8	79	2	1	8
Automobile for farm use	40	40	66	103	1	11	71
Miscellaneous	41	38	47	115	6	11	27
Total cash costs	2, 696	1, 466	3, 157	7, 581	706	1, 398	3, 901
Noncash costs:							
Reserves for depreciation—							
Buildings	69	96	83	158	36	40	49
Equipment	47	48	62	198	6	5	42
Operator's labor	479	525	629	1, 235	135	220	563
Family labor	12	62	12	14	1	--------	5
Total noncash costs	607	731	786	1, 605	178	265	659
Total costs	3, 303	2, 197	3, 943	9, 186	884	1, 663	4, 560
Credit deductions:							
Care of young groves	201	135	421	509	50	84	223
Receipts from other crops	66	127	89	190	22	18	40
Miscellaneous income	100	286	220	106	36	17	34
Total deductions	367	548	730	805	108	119	297
Net cost, without interest	2, 935	1, 649	3, 213	8, 381	776	1, 544	4, 263
Interest on capitalization at 8 per cent	2, 371	1, 484	2, 795	6, 660	794	1, 317	2, 915
Net cost per grove, with interest	5, 306	3, 133	6, 008	15, 041	1, 570	2, 861	7, 178
	Cost per acre						
Net cost with interest (all fruit)	288	364	293	271	334	292	308
Net cost without interest (all fruit)	160	192	157	151	165	158	183
	Boxes	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*
Yield per acre (all fruit)	166	180	174	161	193	165	181
Yield per acre (oranges)	152	158	145	147	183	138	194
Yield per acre (grapefruit)	182	218	198	192	198	193	166
	Cost per box						
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Oranges, net cost with interest	1. 89	2. 30	2. 02	1. 84	1. 83	2. 12	1. 59
Oranges, net cost without interest	1. 05	1. 22	1. 08	1. 03	. 90	1. 14	. 94
Grapefruit, net cost with interest	1. 58	1. 67	1. 48	1. 41	1. 69	1. 51	1. 86
Grapefruit, net cost without interest	. 88	. 88	. 79	. 79	. 83	. 82	1. 10

group. In the case of the small groves, the owner group shows higher acre costs than the caretaker group largely because of the greater overhead.

The average cost per box varied from year to year largely because of variations in the prices of cost items and yields of fruit. The six-year average costs on the 100 groves including interest, were: Oranges, $1.89 per box, and grapefruit, $1.58 per box; without interest, oranges, $1.05, and grapefruit, $0.88 per box. Since the last year of this study (1922) production costs have changed somewhat. These changes are indicated in figure 8.

INCOMES FROM CITRUS-FRUIT FARMS

The six-year average (1917–1922) income from the 100 grove farms studied indicates, at least for the period studied, that citrus-fruit growing was a profitable industry. The average operator, besides wages for his labor, received 11.8 per cent on a capitalization of $31,542 (Table 27). If interest on the average capitalization at the going rate, that is 8 per cent, is deducted from the farm income, then the average grower over the six-year period received $1,668 for his own labor. In addition, several of the growers received a part of their living from the farm in the form of food, fuel, and house rent. On the average, the value of these items amounted to $390 per farm in 1919 (Table 28). These figures are averages for only those owners who lived on their farms.

From 1917 to 1922 was a period of relatively high prices, particularly during four years of this study. The prices received for oranges and grapefruit were high as were the items entering into operating expenses (fig. 8). The net results, however, for the period of the study were good profits in citrus-fruit growing.

TABLE 27.—*Summary of the farm business, Polk County, Fla., average 1917–1922*

Item	Average per farm: (100 farms)						
	1917	1918	1919	1920	1921	1922	6-year average
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Farm area	40.5	41.2	41.6	41.1	40.9	40.6	41.0
Crop area	24.2	25.5	26.4	26.2	26.7	26.9	26.0
Bearing fruit	14.4	15.9	18.2	19.6	20.6	21.0	18.4
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Total capitalization	20,656	21,702	28,698	35,906	40,512	41,776	31,542
Total receipts	2,700	6,011	8,512	10,301	5,530	9,044	7,016
Total expenses	1,487	2,082	2,823	3,621	3,507	3,428	2,824
Farm income	1,213	3,929	5,689	6,680	2,023	5,616	4,192
Interest on capital at 8 per cent	1,652	1,736	2,296	2,872	3,241	3,342	2,523
Labor income [1]	−439	2,193	3,393	3,808	−1,218	2,274	1,668
Operator's labor	364	380	529	558	531	509	479
Unpaid family labor	7	9	20	5	16	18	12
Family income	1,220	3,938	5,709	6,685	2,039	5,634	4,204
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Return on capital	4.1	16.4	18.0	17.1	3.7	12.2	11.8

[1] A minus (−) indicates the amount the farm income lacked of covering both the operator's labor and 8 per cent interest on the capitalization.

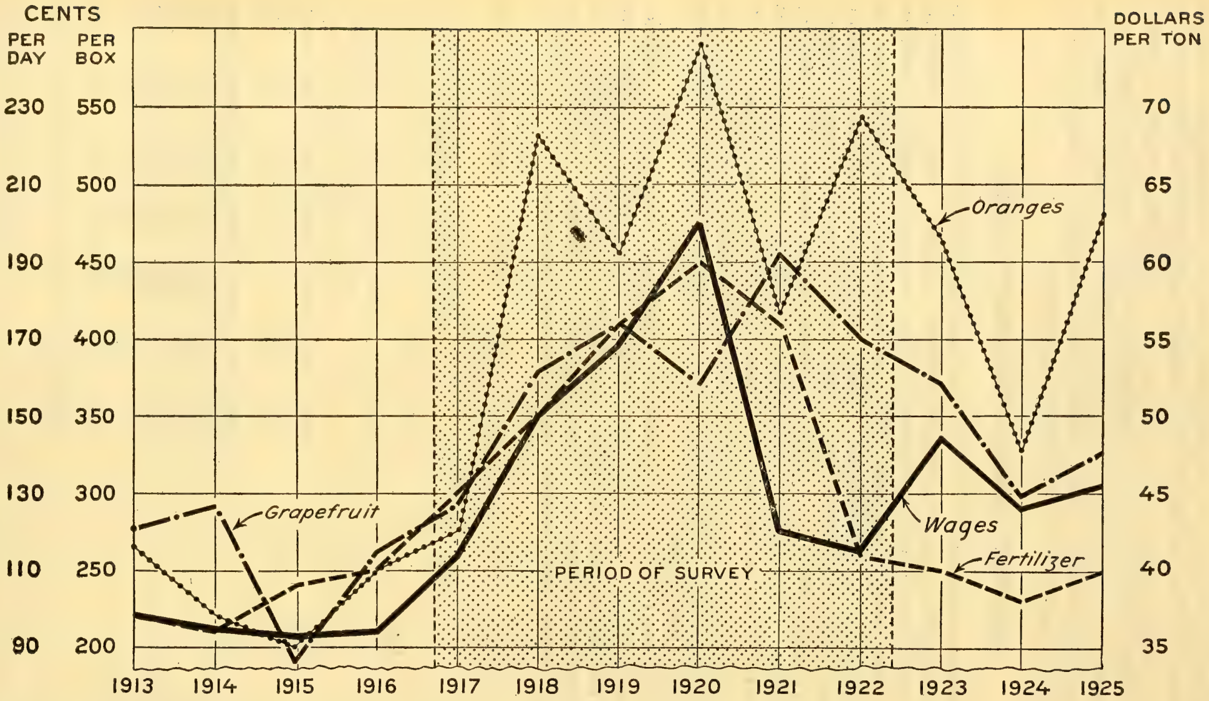

FIG. 8.—The prices of fertilizer are the average prices paid per ton by the growers in Polk County, Fla. The wages are the average wages paid per day, with board, as reported for the State. Orange and grape-fruit prices are the average wholesale prices for good quality, packed fruit in New York. During the period of the study the prices of grapefruit increased in about the same proportion as fertilizer and wages, while the prices of oranges were on a considerably higher level than the cost price of the important expense items. This would indicate that the years of the study were favorable for the citrus-fruit production industry

It would seem, however, that even with lower prices of fertilizer and lower wage rates the outlook for earnings in citrus-fruit growing in Florida, in the immediate future, could hardly be expected to equal those for the years 1917 to 1922.

TABLE 28.—*Distribution of family living from the farm, 59 farms, Polk County, Fla., 1919*

Items furnished by farm for family use	Unit	59 farms reporting—adult equivalent per farm, 3.4			Computed on 100-grove basis—adult equivalent per farm, 2	
		Quantity	Value of food items		Quantity	Value
			Dollars	*Per cent*		*Dollars*
Corn	Bu.	(1)	1	0.7	(1)	(1)
Sirup	Gal.	1	2	1.4	0.9	1
Potatoes	Bu.	1	2	1.4	.8	1
Fruit and garden			43	30.5		26
Miscellaneous			(1)			(1)
Butter	Lb.	28	15	10.6	16	9
Milk	Gal.	91	17	12.1	53	10
Beef	Lb.					
Mutton	Lb.					
Eggs	Doz.	56	23	16.3	33	13
Poultry	Head	22	18	12.8	13	11
Pork	Lb.	100	20	14.2	58	12
Honey	Lb.					
Total food			141			83
Wood	Cord	1	6		.8	4
Use of house			243			143
Total value			390			230
Value per adult equivalent			115			115

---

[1] Less than one-half of one.

The average returns on the capitalization varied from 3.7 per cent in 1921 to 18 per cent in 1919, but averages if not properly interpreted often prove misleading. Not all of these farms were so successful as the averages would seem to indicate. The situation as to income is shown in Table 29, where the farms are grouped according to the size of the farm income and the percentage return on the capitalization. The variations in farm income reflect both management and size of business, whereas the variations in percentage return on capitalization more nearly reflect degrees of management, assuming the capitalization on each farm to be on a fair basis.

TABLE 29.—*Distribution of incomes, farm income, and percentage return on capitalization—six-year averages (100 farms)*

Farm income	Number of farms	Percentage return on capitalization	Number of farms
$500 and less	13	Less than 1 per cent	13
$500 to $1,500	10	1 to 4 per cent	20
$1,501 to $2,500	22	5 to 8 per cent	20
$2,501 to $3,500	12	9 to 12 per cent	13
$3,501 to $4,500	5	13 to 16 per cent	14
$4,501 to $5,500	5	17 to 20 per cent	9
$5,501 to $6,500	4	21 to 24 per cent	5
$6,501 to $7,500	3	25 to 28 per cent	2
$7,501 to $8,500	2	29 to 32 per cent	
$8,501 to $9,500	1	33 to 36 per cent	3
Over $9,500	9	Over 36 per cent	1
Average of 5 lowest	−$145	Average of 5 lowest	−2.7 per cent
Average of 5 highest	28,258	Average of 5 highest	25.3 per cent
Average of all farms	4,192	Average of all farms	11.8 per cent

The yearly income from citrus growing is influenced by many factors most important of which are (1) yield per acre, (2) price received per box, (3) variety of fruit, and (4) operating cost per acre.

The average yield per acre of bearing trees and the average price received is shown in Table 30 for grapefruit, oranges, and tangerines, Grapefruit leads in yields per acre with 189 boxes, followed by tangerines with 177 boxes, and oranges with 151 boxes for the six years. There was considerable variation in the average yield per acre over the period of the study. Grapefruit average yields varied from 120 boxes in 1917 to 259 boxes in 1920 and there were similar variations for the other fruits. The total receipts follow closely the total yield as will be seen by comparing the high yield years with the high receipts per acre years. Receipts per acre of citrus fruit is the most important factor directly affecting incomes since over 97 per cent of the receipts on these farms was from citrus fruits (Tables 31 and 32).

There was a marked variation in the yield per acre from farm to farm. More farms had yields of from 151 to 200 boxes per acre than of any other yields, although there were several farms that had less than 100 and several that had over 250 boxes per acre (fig. 9). The most important factors affecting yields per acre were quantity of fertilizer used, quantity of spray material used, number of trees per acre, age of trees, and variety of fruit. The importance of these factors have already been discussed.

TABLE 30.—*Average yield per acre of bearing grove and average price received per box for grapefruit, oranges, and tangerines, 100 farms, Polk County, Fla., 1917–1922*

Item	1917	1918	1919	1920	1921	1922	Average
Average yield per acre:	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*	*Boxes*
Grapefruit	120	145	155	259	181	234	182
Oranges	109	134	184	194	142	146	152
Tangerines	132	121	176	219	277	190	186
Average price per box received by grower:	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Grapefruit	1.39	1.84	2.16	1.45	1.28	1.52	1.61
Oranges	1.51	3.15	2.98	3.22	1.57	3.13	2.59
Tangerines	2.18	3.75	4.03	4.22	3.94	4.06	3.70
Receipts per acre:							
Grapefruit	167	267	335	376	232	356	289
Oranges	165	422	548	625	223	457	407
Tangerines	288	454	709	924	1,091	771	706

TABLE 31.—*Average and annual distribution of receipts on 100 farms, Polk County, Fla., 1917–1922*

Source of income	Per farm						
	1917	1918	1919	1920	1921	1922	Average, 1917–1922
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Total farm receipts	2,700	6,011	8,512	10,301	5,530	9,044	7,016
Crops:							
Grapefruit	912	1,733	2,550	3,225	1,989	3,123	2,255
Oranges	1,300	3,627	5,143	6,170	2,470	5,169	3,980
Tangerines	231	409	636	739	980	694	615
Other fruit	33	36	33	20	18	19	26
Hay	5	5	2	1	----------	----------	2
Other crops	99	45	18	43	9	13	38
Increase in livestock	40	31	43	34	21	----------	28
Man labor, outside	26	21	16	1	3	2	12
Team labor, outside	31	50	56	58	28	11	39
Machinery work, outside	8	5	10	2	2	7	6
Other receipts [1]	15	49	5	8	10	6	15

[1] Other receipts include increases in feed, rent for garage, house rent, income from bags, lumber, wood, etc.

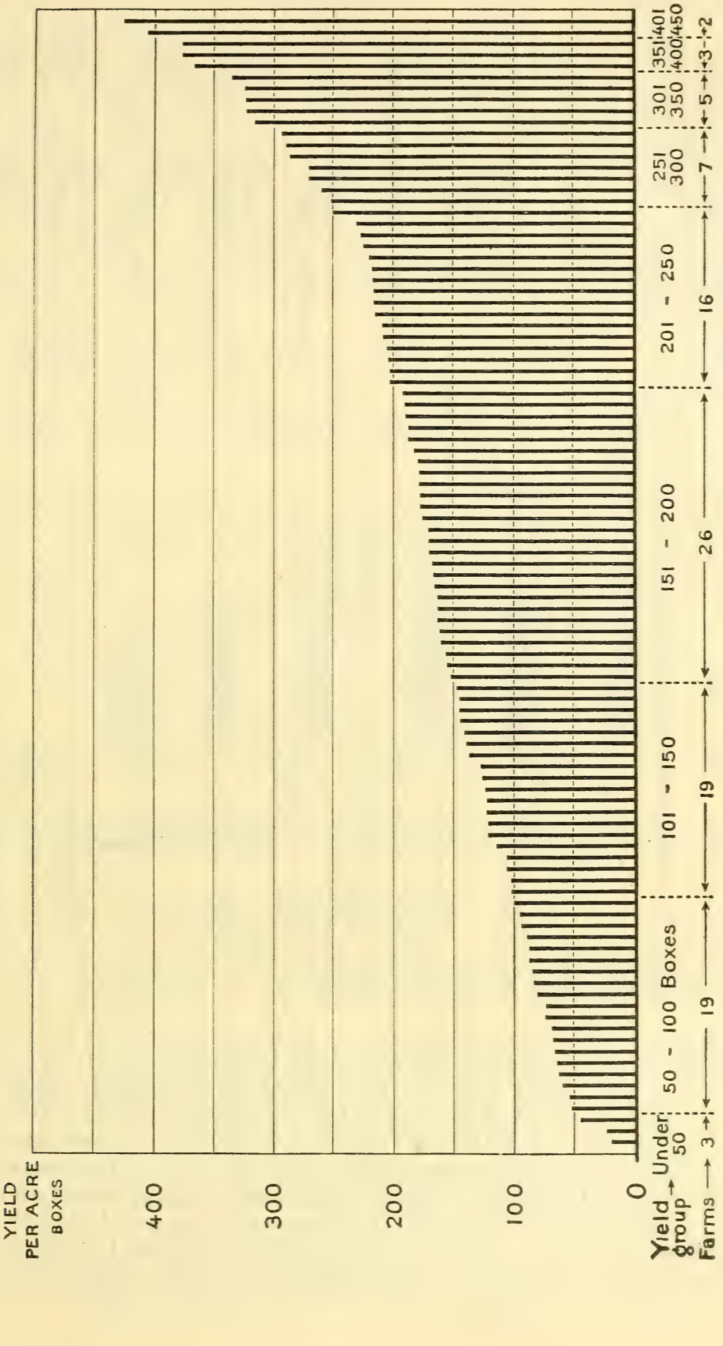

FIG. 9.—There was a wide variation in yield per acre of fruit from farm to farm. The most important factors affecting yields per acre were quantity of fertilizer used, quantity of spray material used, number of trees per acre, age of trees, and variety of fruit

TABLE 32.—*Distribution of receipts, by type of management and size of groves, Polk County, Fla., average 1917–1922*

Item	Average for all farms	Owner-operator groves			Caretaker groves		
		1 to 12 acres	13 to 24 acres	25 acres and over	1 to 6 acres	7 to 12 acres	13 acres and over
Number of groves	----------	13	12	13	12	36	14
FARM RECEIPTS							
Crops:	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Grapefruit	2,255	1,185	2,781	5,288	621	1,481	3,377
Oranges	3,980	1,889	3,839	13,426	1,250	1,694	5,486
Tangerines	615	397	939	1,422	58	223	1,273
Other fruit	26	18	27	80	1	16	33
Hay	2	4	3	1	1	1	3
Other crops	38	105	59	109	20	2	3
Increase livestock	28	141	62	----------	23	7	26
Man labor, outside	12	23	46	3	5	6	----------
Team labor, outside	39	106	80	98	----------	----------	1
Machinery work, outside	6	5	25	17	----------	----------	----------
Other receipts [1]	15	11	7	43	8	6	8
Totals	7,016	3,884	7,868	20,487	1,987	3,436	10,210

[1] Other receipts include increase in feed, rent for garage, house rent, income from bags, lumber, wood, etc.

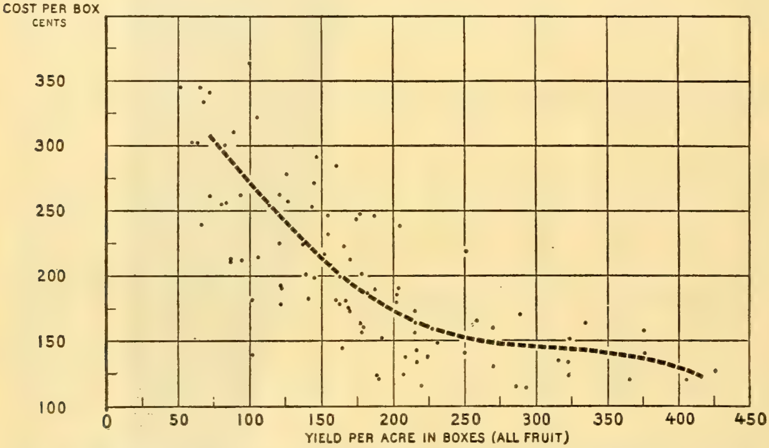

FIG. 10.—Increasing yields per acre on an average are associated with decreasing costs per box. The cost per acre was increased with use of greater amounts of labor and material, but the cost per box was decreased because of greater yields

Relationship between yield per acre and cost per box is illustrated in Figure 10. The graph indicates that increasing yields are associated with decreasing costs. The correlation between yield per acre and cost per box was rather high, −$0.68, indicating that a change in the yield of 100 boxes per acre would cause a reduction in the cost per box of 54 cents. This ratio of variation is constant, roughly, only as the yield increases or decreases 50 per cent from the normal. That is, the point of diminishing returns per dollar of cost was reached when the average yield was 253 boxes and the cost per box was $1.09. As the yield increased beyond 253 boxes there was very little change in the cost per box. It was profitable to increase the yield, however, as no change in the cost per box left the same margin between cost and selling price, but the number of margins was increased. Indications are that it would be profitable to increase the average yield by 100 per cent.

The grove farms that were most profitable used most labor, fertilizer, and spray material, and had most trees per acre. The cost per acre was increased with the use of greater amounts of labor and material, but the cost per box was decreased because of greater yield. The effect on net returns when the cost per acre is increased is shown in Figure 11. This figure illustrates that economy in the management rests not so much upon reducing the absolute amount of the expenses of operation as upon the wiser course of spending so as to increase the yield per acre, which in turn will result in a reduced cost per box and an increased margin of profit per box and per acre.

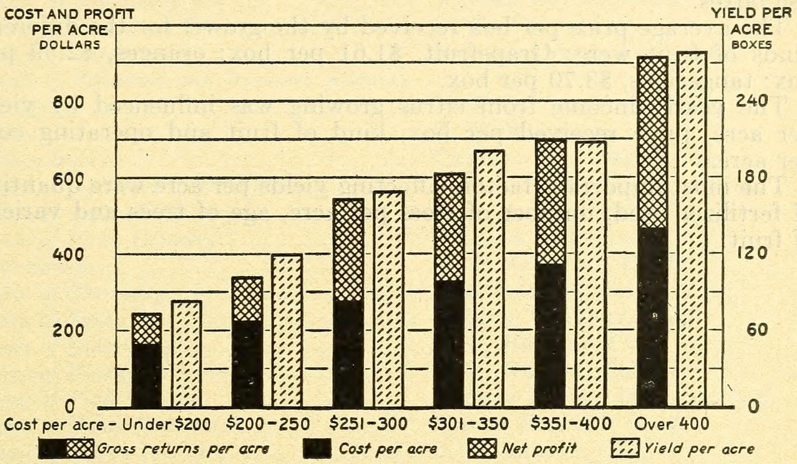

FIG. 11.—The grove farms that were most profitable used most labor, fertilizer, and spray material and had most trees per acre. Economy in management rests not so much upon reducing the absolute amount of expense of operation as upon the wiser course of spending so as to increase the yield and receipts

SUMMARY

The production of citrus fruit in Polk County is a highly specialized farm enterprise. In most instances, no other source of farm income was reported.

The cost of developing a grove up to and including the fifth year was, on the average, $536. Of this amount, $125 was value of raw land, $194 was cost of clearing, fencing, preparation of land, trees, and setting out trees, and $217 for maintenance cost.

The average tillable acreage per farm was 27.6 of which citrus fruit occupied 24.3 acres. The acreage in different kinds of fruit was divided as follows: Oranges 13.7 acres; grapefruit 9.1 acres; tangerines 1.3 acres. There were 18.4 acres of bearing fruit on the average during the period of this study.

The average farm was capitalized at $31,542. The capital investment increased from $20,656 in 1917 to $41,776 in 1922.

Thirty-eight of the groves were operated by owners and 62 groves were operated by caretakers. The caretakers furnished all labor, equipment and supervision. Financially the caretaker groves did just as well as those operated by the owners.

The gross receipts were $7,016 per farm on the average, increasing from $2,700 in 1917 to $10, 301 in 1920. Ninety-seven per cent of these receipts were from citrus fruits. Total expenses were on the average $2,824 per farm, increasing from $1,487 in 1917 to $3,621 in 1920. Of these, fertilizer was the most important item constituting 45 per cent of the total and labor was the second with 29 per cent.

The return to capital and supervision was $4,192 per farm on the average, increasing from $1,213 in 1917 to $6,680 in 1920. The average return on capitalization was 11.8 per cent, ranging from 4.1 per cent in 1917 to 18 per cent in 1919.

The average yields per acre for the different kinds of fruit were as follows: Grapefruit, 182 boxes; oranges, 152 boxes; and tangerines, 186 boxes.

The average price per box received by the grower for the different kinds of fruit were: Grapefruit, $1.61 per box; oranges, $2.59 per box; tangerines, $3.70 per box.

The yearly income from citrus growing was influenced by yield per acre, price received per box, kind of fruit and operating cost per acre.

The most important factors affecting yields per acre were quantity of fertilizer used, number of trees per acre, age of trees and variety of fruit.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
10 CENTS PER COPY
▽

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

November 1, 1926

Secretary of Agriculture	W. M. Jardine.
Assistant Secretary	R. W. Dunlap.
Director of Scientific Work	A. F. Woods.
Director of Regulatory Work	Walter G. Campbell.
Director of Extension Work	C. W. Warburton.
Director of Information	Nelson Antrim Crawford.
Director of Personnel and Business Administration	W. W. Stockberger.
Solicitor	R. W. Williams.
Weather Bureau	Charles F. Marvin, *Chief.*
Bureau of Agricultural Economics	Lloyd S. Tenny, *Acting Chief.*
Bureau of Animal Industry	John R. Mohler, *Chief.*
Bureau of Plant Industry	William A. Taylor, *Chief.*
Forest Service	W. B. Greeley, *Chief.*
Bureau of Chemistry	C. A. Browne, *Chief.*
Bureau of Soils	Milton Whitney, *Chief.*
Bureau of Entomology	L. O. Howard, *Chief.*
Bureau of Biological Survey	E. W. Nelson, *Chief.*
Bureau of Public Roads	Thomas H. MacDonald, *Chief.*
Bureau of Home Economics	Louise Stanley, *Chief.*
Bureau of Dairy Industry	C. W. Larson, *Chief.*
Office of Experiment Stations	E. W. Allen, *Chief.*
Office of Cooperative Extension Work	C. B. Smith, *Chief.*
Library	Claribel R. Barnett, *Librarian.*
Federal Horticultural Board	C. L. Marlatt, *Chairman.*
Insecticide and Fungicide Board	J. K. Haywood, *Chairman.*
Packers and Stockyards Administration	John T. Caine III, *in Charge.*
Grain Futures Administration	J. W. T. Duvel, *in Charge.*

This bulletin is a contribution from

Bureau of Agricultural Economics	Lloyd S. Tenny, *Acting Chief*
Division of Farm Management and Costs	H. R. Tolley, *Agricultural Economist in Charge.*